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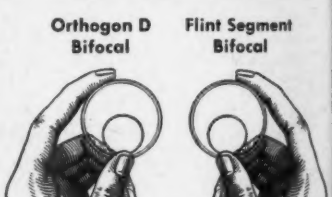

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 25 JUNE, 1942 NUMBER 6

OCULAR PEMPHIGUS AND ITS RELATION TO PEMPHIGUS OF THE SKIN AND MUCOUS MEMBRANES*

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The disease described by von Kries[1] in 1878 as essential shrinkage or shriveling of the conjunctiva is now generally accepted as pemphigus of the conjunctiva. Although some writers, notably Franke,[2] have maintained that so-called ocular pemphigus is unrelated to the skin disease known as pemphigus, and therefore should more properly be called essential shrinkage of the conjunctiva, the two terms are used in the literature to describe the same pathologic process.

Almost all reports of ocular pemphigus have come from ophthalmologists; but our purpose is to discuss here pemphigus of the conjunctiva from an ophthalmologic as well as from a dermatologic viewpoint. In order properly to study the disease the collaboration of the ophthalmologist with the dermatologist is essential.

ESSENTIAL SHRINKAGE OF THE CONJUNCTIVA

The term "essential shrinkage of the conjunctiva" has led to confusion. Shriveling of the conjunctiva is a symptom—the end result of a pathologic process that may be caused by pemphigus; it may, however, accompany bullous diseases other than pemphigus; or it may be the end result of any violent inflammation of the conjunctiva accompanied by destruction of tissue. When the shrinkage is caused by pemphigus, it presents certain characteristics that differentiate it from that due to other causes; these will be discussed farther on.

We believe that the term "pemphigus of the conjunctiva" should be applied to a slow, progressive shrinkage of the conjunctiva that occurs as part of pemphigus of the mucous membranes. The term "shrinkage" or "shriveling" of the conjunctiva should be used to designate a similar process, but one produced by a disease other than pemphigus.

CLASSIFICATION OF PEMPHIGUS OF THE CONJUNCTIVA

As a result of a critical review of the cases reported under such terms as ocular pemphigus, pemphigus of the conjunctiva, essential shrinkage, and essential shriveling of the conjunctiva, we would divide pemphigus of the conjunctiva into three groups. One of these groups (group II) would constitute pemphigus of the conjunctiva as it is here defined.

GROUP I. SO-CALLED ACUTE PEMPHIGUS OF THE CONJUNCTIVA

This group comprises an acute infectious disease of infants and children and, at times, of adults. It is characterized by severe conjunctivitis, pseudomembranous or purulent, with swelling of the eyelids, constitutional symptoms, high temperature, severe stomatitis, and the presence of an eruption. This eruption consists of variable lesions, with bullae and vesicles, or solely with bullae. The disease may end

*From Wills Hospital. Read before the American Ophthalmological Society, Hot Springs, Virginia, May 30, 1941.

fatally. The cornea may be destroyed by ulcers that form as the result of previous vesicles. Panophthalmitis may ensue. Another sequela, similar to the end result of pemphigus of the conjunctiva, is cicatricial obliteration of the conjunctiva and loss of transparency of the cornea. These are the sequelae of violent inflammation of the conjunctiva followed by destruction of the tissue.

This group includes cases designated as acute pemphigus of the conjunctiva, such as are reported by Klemm,[3] Senator,[4] Seggel,[5] von Michel,[6] Pergens[7] (one case), Rynbech,[8] Gelpke,[9] and Hardy and Lamb[10] (first case).

The ocular type of case included in this group has been variously designated as acute pemphigus, febris bullosa, toxic erythema, erythema multiforme with pseudomembranous conjunctivitis. We believe it represents the cases reported by Stevens and Johnson[11] under the head of "New eruptive fever associated with stomatitis and ophthalmia," and similar cases reported by Ginandes[12] and Bailey.[13]

In all probability this disease represents a severe atypical form of erythema exudativum multiforme (Hebra).* It is doubtful if pemphigus of the conjunctiva runs the acute ocular inflammatory course that characterizes the aforementioned syndrome.

GROUP II. PEMPHIGUS OF THE CONJUNCTIVA

This group includes those cases that conform to our conception of pemphigus of the conjunctiva. We regard this condition as one of the manifestations of pemphigus of the mucous membranes, and define it as that pathologic process characterized by xerosis, chronic inflammation of the subconjunctival tissue that causes the conjunctiva to shrink, with the formation of scar tissue and symblepharon, and union of the palpebral conjunctiva with the conjunctiva of the bulb, producing ankyloblepharon and the extension of a skinlike, horny membrane over the cornea, resulting in blindness. A distinctive feature of the disease is its slow progression. Vesicles involving the conjunctiva are seldom demonstrable. The patient may or may not exhibit vesicles or their sequelae involving other mucous surfaces; he may or may not have bullae or blebs on the skin. Observation over an extended period of time may be necessary in order to make a diagnosis in a given case.

Pemphigus of the conjunctiva can be divided into two classes:†

1. That in which the process is confined to the eye.

2. That group in which ocular involvement is preceded, accompanied, or followed by involvement of one or more of the mucous membranes and/or cutaneous lesions (bullae, blebs).

Age. Pemphigus of the conjunctiva is usually a disease of later life. There are, however, published reports (Lang,[14] Baeumler,[15] Meyer,[16] Bouchart,[17] Wood,[18] Saemisch,[19] Redslob,[20] Rycroft[21]) of the

* Variant forms of erythema multiforme have been designated differently. A milder form of the syndrome, discussed in group I, has been called ectodermosis erosiva pluriorificialis. For a complete discussion of the variable picture of erythema multiforme, see Klauder, J. V. Ectodermosis erosiva pluriorificialis: its resemblance to the human form of foot and mouth disease and its relation to erythema exudativum multiforme. Arch. Derm. and Syph., 1937, v. 36 pp. 1067-1077.

† Franke[2] divided his series of cases of pemphigus of the conjunctiva, compiled from the literature, into the following three groups: (a) That accompanying an acute bullous eruption (this corresponds to our group I); (b) that accompanying a chronic skin disease; (c) that unaccompanied by cutaneous lesions. The accompanying skin diseases in his second group included pemphigus as well as other skin affections, chiefly those exhibiting bullous lesions.

disease appearing in early adult life. Many cases that are reported as pemphigus of the conjunctiva (or shrinkage of the conjunctiva) occurring in childhood and early adult life do not correspond with pemphigus of the conjunctiva as it is here defined. Most of these cases can be assigned to groups I or III.

Frequency. The statistical incidence of pemphigus of the conjunctiva has been reviewed by a number of writers (Franke,[2] Pergens,[7] Hardy and Lamb[10]). The disease occurs in about the ratio of one in 20,000 ocular cases. However, in an analysis of 31,352 reports of blind eyes in 15,676 blind persons in Pennsylvania,[22] pemphigus was cited as the cause in 22 eyes. We do not regard the disease as being as rare as is generally believed. It is likely to go unrecognized, especially during the early stages, and also when unassociated with the lesions of pemphigus elsewhere. It is mistaken for trachoma probably more often than for any other disease.

Sex and race. In our series of 11 cases there were 8 females and 3 males. In Franke's series of patients, compiled from the literature, there were 43 males and 45 females, and in Pergens's cases, 43 were males and 49 females. No racial incidence of the disease has been observed. Pemphigus of the skin, on the other hand, is more common among Hebrews, and produces a higher mortality among them. Pemphigus of the mucous membranes does not pursue any different course among the latter; in our series of cases there were two Hebrews.

Bilateral or unilateral. The disease may begin in both eyes and progress uniformly. It is more likely, however, that the second eye will be involved after an interval, usually of less than two years. In the patient reported by Bane and Bane,[23] this interval was as long as seven years. At different stages of the disease one eye is usually involved more than the other.

Symptomatology. The early symptoms of the disease are those of a simple catarrhal inflammation of the conjunctiva with a thick, "ropy," mucoid discharge. The usual complaint of the patient is of burning and itching of the eyes. These inflammatory symptoms occur with periods of recrudescence for years. Later the conjunctiva becomes thickened, redundant, dry, and can easily be wrinkled. In the early stage, traction on the conjunctiva brings into view underlying white bands running from the palpebral conjunctiva to the limbus. Later, symblephara appear, the conjunctiva becomes shriveled, atrophic, and is eventually replaced by fibrous tissue. The cul-de-sacs become shallow and eventually obliterated. The palpebral fissures become small. The lids droop, as in ptosis. The skin of the eyelids covers over the inner and outer canthi. This last was pronounced in our cases 1, 2, and 7, in which the skin extended across and joined the lids out to or even past the canaliculi, entirely covering the caruncle. This symptom, present in three of our cases, has not been sufficiently stressed. According to our knowledge, Redslob[20] is the only writer who has mentioned it. In the terminal stage the lids are fixed to the globe, and the cornea is covered with a skinlike membrane. Movement of the globe is restricted. This restriction may cause considerable pain. Early in the disease a croupous membrane may appear, leaving, after removal, either a visible ulcer or an intact conjunctiva.

The disease may also pursue another course, in which there is an absence of irritative symptoms. This occurred in the majority of our patients. There is gradual shriveling of the conjunctiva, together

with symblephara. The conjunctival sac is eventually obliterated by ankyloblepharon. In the absence of irritative symptoms the patient is ignorant of the onset of the disease. Often the first complaint is that of impaired vision due to the loss of transparency of the cornea.

Vesicles may involve the cornea or any portion of the conjunctiva. These soon rupture, are transitory, and, therefore, frequently go unobserved. A vesicle may rupture and leave a circumscribed area of redness, or it may disappear without leaving any trace. In size they have been described to measure up to that of a bean. Vesicles apparently constitute part of the irritative or inflammatory stage of the disease, and are not seen during the terminal or atrophic stage. They may, however, appear on other mucous surfaces, notably on the mouth.

The presence of vesicles was observed in one seventh of the cases of pemphigus of the conjunctiva compiled by Franke,[2] and in about one fourth of those compiled by Pergens.[7] In our series, vesicles on the conjunctiva were observed in one patient.

A pterygiumlike growth has been described. It arises from the outer or inner lid angle, and extends toward the cornea, which it may either cover or encircle.

Cornea. Vesicles involving the cornea may cause keratitis, ulceration, perforation, or hypopyon. Vascular keratitis often occurs, and a pannus may cover the cornea.

In the terminal stage of the disease the cornea becomes cloudy, and its surface is dull, dry, and covered with a parchmentlike membrane. The cornea becomes involved at variable intervals after the onset of the disease. It may remain grossly intact for a prolonged period despite considerable involvement of the conjunctiva, or it may become involved relatively early in the disease.

Slitlamp appearances. On stretching the conjunctiva, fine white lines can be seen with the slitlamp. The surface is smooth and velvety. Tiny spiral vascular loops, seen immediately under the surface, seem to be independent of the normal vascular system. Sometimes only a few, but often a great number of these, can be seen. The cornea is almost always affected. Its thickness varies—often it is very thin; in our case 3 it was only 0.1 mm. thick in places. The infiltration is variable, being mostly peripheral and superficial, but often deep. The affected areas are soft, cloudy, and with ill-defined outlines. The process begins around the periphery, and gradually progresses toward the center. The limbal haze is always widened, with extension of the vascular limbal loops. Vascularization of the cornea is mostly superficial, but vessels are often seen deep in the cornea. Frequently there is a pannuslike formation. This may be seen at any point around the cornea, but is mostly above and below. The gray base is homogeneous, very superficial, and thin. The characteristic skinlike covering of the cornea in pemphigus presents exactly the same surface appearance as does the epidermal surface of the skin; that is, the markings, oiliness, and desquamated cuticular particles. This covering is usually sufficiently transparent to allow a fairly clear view of the underlying cornea. Blood vessels are never seen upon its surface nor in the membrane itself; but in every case blood vessels can be seen between it and the surface of the cornea beneath.

Differential diagnosis. Symblepharon, ankyloblepharon, corneal scars, and shriveling and cicatrization of the conjunctiva may, any or all of them, be seen as the result of burns, traumatism, severe inflammations and the like, and trachoma. In the absence of bullae or blebs on the skin or mucous membranes elsewhere, any

of the causes just mentioned, except trachoma, can be learned from the history, the course of the disease, and the characteristic appearance. The ocular picture will be the permanent end result.

Pemphigus should be easily differentiated from trachoma by the presence of lesions on the skin or mucous membrane, the extremely slow progression in many instances, and the frequent prolonged periods of remission, the smoothness of the conjunctival surface, the absence of follicles or granules, the deep corneal infiltration, the comparatively benign type of pannus that may occur anywhere around the limbus, the frequency and type of symblepharon, and later the ankyloblepharon, their attachment to the cornea, and by the characteristic cuticular membrane covering the cornea.

Course and prognosis of ocular involvement. There is considerable variation in the course of the disease. Its progress may be slow, with long periods—years—of remission. On the other hand, its course may be rapid, and blindness ensue in about two years. The patient in case 1 was blind about 21 months after the onset of the first subjective ocular symptoms, whereas the patient in case 2 has a visual acuity in the right eye of 6/12, and in the left one of 6/15, about 11 years after the onset of the disease. Visual acuity in the less involved eye of the patient in case 9 is 6/12, and the duration of the disease in this patient is 20 years.

The prognosis, so far as concerns blindness, can be evaluated only from the following considerations: the degree of ocular involvement; the rate of progress of the disease; and the age of the patient.

The progress of the disease with reference to death resulting from a generalized eruption of pemphigus is discussed later.

Involvement of mucous membranes in general. Involvement of one or more mucous surfaces may precede, accompany, or appear subsequent to involvement of the conjunctiva.

The characteristic lesions consist of vesicles, their number varying from one to many. Such vesicles soon rupture, leaving a tender, marginated, red, eroded area that may be covered with a yellow membrane or be the seat of a superficial ulceration. The sites of ruptured vesicles may become confluent, to form an irregularly shaped area. Vesicles appear on all the mucous surfaces, the mouth and throat being the most common sites, and all parts of which may be involved. The membranes most frequently affected are the buccal mucosa, the inner surfaces of the lips, and the under surface of the tongue. We believe that eroded areas or superficial ulceration on any mucous surface always indicate the site of a previous vesicle. We observed discrete, eroded areas on the nasal septum, in the vagina, and on the mucous surface of the anus. The patient may not be cognizant of the presence of lesions on these mucous surfaces. In the absence of positive findings at examination, a history of nosebleed or of spots of blood on the handkerchief or underwear suggests involvement of the nose or vagina. One of our patients (case 2) voided blood-tinged urine, a symptom that suggested the occurrence of vesicles causing eroded areas. In the patients reported by von Michel[6] and by Coffin[24] vesicles occurred on the epiglottis. In Shumway's[25] case a vesicle was seen in the bladder at the time cystoscopic examination was made.

Another lesion seen in pemphigus is scarring, with shriveling, distortion, and partial obliteration of the involved area. A common location for this manifestation is the nasopharynx, where cicatrization causes considerable distortion. The uvula may be shriveled or obliterated, and the

posterior pillars of the fauces may be fused to the posterior surface of the nasopharynx, which may become considerably narrowed.

We have observed linear areas of scars on the buccal mucosa (case 2), fusion of the buccal mucosa to the outer surfaces of the alveolar processes, with disappearance of the intervening space, and atresia of the urethra and of the vagina (fig. 3). In Traub's[26] patient there was adherence of the foreskin to the glans. In Redslob's[20] case there was stricture of the urethra, and in Adam's[27] patient there was stricture of the esophagus, which ruptured and caused death. The mucous membranes of the nose and larynx were atrophic in Blondel and Bonhomme's[28] patient, and vocal change was present. Conlon's[29] patient was unable to open her mouth widely on account of cicatrization of the buccal mucosa. Trautmann[30] reviewed many reports of pemphigus of the mucous membranes with or without conjunctival or cutaneous involvement in which cicatrization of different mucous surfaces occurred.

Cicatrization, fusion, and atresia of other mucous surfaces are comparable to the terminal stage of conjunctival involvement. Although the association of pemphigus of the conjunctiva with vesicles in the mouth or with extensive scarring involving the nasopharynx has been stressed, few reports mention the examination of other mucous surfaces. In making a study of patients with pemphigus of the conjunctiva, all mucous surfaces, as well as the skin, should be examined.

Cutaneous lesions. Cutaneous lesions take the form of a recurring eruption of bullae or blebs surrounded by normal skin. After rupture of a bleb occurs, an erosion results that may become crusted. A recurring eruption of blebs, such as occurs in patients with pemphigus of the conjunctiva, is in conformity with the concept of pemphigus.

Usually, at least in the early stage of the disease, the eruption is localized. Its place of onset is variable, the face, including the eyelids, being a favorite location. The eruption may be scattered, and yet there may be a sparse number of blebs. This we believe is less common than is a localized eruption. In a patient reported by Weidler[31] the eruption was localized over the abdomen. In a patient reported by Adam[27] it was confined to the right arm, and in the patient reported by Campbell,[32] at the onset, it was limited to one foot. The patients reported by Traub,[26] Redslob,[20] Koerber,[33] and Miller[34] had, in the beginning of the disease, a recurring eruption of blebs confined to the glans.

Cases have been reported in which, after a variable period from the onset of the disease in the conjunctiva or other mucous membranes, a generalized bullous eruption ensued which ended fatally. This termination is more typical of pemphigus than of localized bullous eruptions. The following cases may be cited: Blondel and Bonhomme's[28] patient had a generalized bullous eruption that ended fatally two years after the onset of the disease in the mouth, the eruption appearing three weeks before death. In Coffin's[24] patient the mouth and throat were first affected. Two years elapsed before the appearance of ocular lesions, and four years before the onset of a generalized bullous eruption. Death was attributed to a septic lesion on the leg. Traub's[26] patient exhibited ocular, nasal, and oral lesions, and had a recurring eruption of pemphigus that terminated fatally. Nikolsky's sign was present.

In Constans's[35] patient (case 1) with pemphigus of the conjunctiva, the final diagnosis of cutaneous involvement was pemphigus foliaceus. In Meyer's[16] patient

pemphigus foliaceus appeared subsequent to conjunctival involvement. In the patient reported by Herzfeld[36] pemphigus foliaceus followed seven years after onset of the disease in the conjunctiva and on the glans.

Interrelation of ocular, mucous membrane, and cutaneous lesions. The variable course of pemphigus of the conjunctiva in relation to the occurrence of other mucous membrane or cutaneous lesions is evident from the following reports:

Terrien, Gougerot, and Hasson's[37] patient exhibited oral and cutaneous lesions for six years prior to involvement of the conjunctiva. Bellencontre's[38] patient had lesions in the mouth and throat for two years prior to the advent of cutaneous and conjunctival symptoms. In Heilborn's[39] patient pemphigus of the conjunctiva was present for nine years, at the onset only the mouth being involved. In the patient reported by Blondel and Bonhomme[28] the disease appeared first in the mouth, later in the eye, and two years later the skin became involved. In the patient (case 1) reported by Rycroft,[21] cutaneous lesions preceded ocular lesions by two years. Clapp's[40] patient had mouth lesions eight years prior to the onset of the disease in the eye. In Bichaton's[41] patient ocular and cutaneous lesions appeared five years after the onset of the disease in the throat.

Redslob[20] reported an unusual case. The patient was 29 years of age. At the age of 14 years he had a bullous eruption that involved chiefly the neck and the glans, and lasted for two years. After a period of remission the mouth and lips became involved. At the age of 24, conjunctival vesicles appeared. Since then there have been frequent eruptions manifested by the development of oral and cutaneous bullae. The bulbar conjunctiva was considerably retracted, the cul-de-sacs almost obliterated, and the mucosa had formed large frenula.

In the one case in our series (see case 11), in which the skin was affected, the lesions on the face appeared shortly after the onset of the ocular symptoms, and within a few months' time of those of the mucous membrane of the mouth. These vesicles have continued since their onset. Shortly after these lesions were first noticed in the vagina, and three months previous to the time of our last examination, lesions appeared on the skin of the arms and legs.

In nine of Franke's[2] series of cases, pemphigus of the skin was definitely diagnosed; in two the diagnosis was doubtful. It should be observed that Franke's series comprises cases that manifested all three of our types.

Pergens divided his series as follows: (1) 17 patients having mucous-membrane and cutaneous vesicles, 9 of whom had acute pemphigus and 8 had chronic pemphigus; (2) 15 with vesicles on mucous surfaces other than the conjunctiva and no cutaneous vesicles; (3) 2 in whom vesicles were confined to the conjunctiva; (4) 16 having no vesicles on the conjunctiva, skin, or other mucous surfaces, the disease in these cases being designated as essential shrinkage of the conjunctiva.

In our series the disease was confined to the conjunctiva in five (cases 3, 6, 7, 9, 10). In these patients the maximum duration of the disease was 30 years (case 7). In one patient (case 2) a conjunctival vesicle was observed; in another (case 8), mucous-membrane involvement was confined to the nasopharynx; one (case 2) had lesions of all mucous surfaces, with atresia of the vagina; and one (case 11) had lesions on the skin and mucous membranes of the mouth and of the vagina.

The relation of pemphigus of the conjunctiva to the concept of pemphigus. The

causative factor in pemphigus* is unknown; there is no laboratory phase in diagnosis. The concept of the disease is a clinical one. This envisages a recurring eruption of vesicles, bullae, or blebs involving the skin and/or mucous membranes, and not conforming to the concept of other diseases exhibiting bullous or vesicular lesions. The disease may be localized or generalized, benign or fatal.

Pemphigus of the conjunctiva is intimately associated with a recurring vesicular eruption of one or more mucous surfaces. Pemphigus of mucous membranes may terminate, as does conjunctival involvement, in cicatrization, with complete or partial obliteration of the affected region. Although no mucous membrane is exempt from cicatrization, this process seems to favor the conjunctiva, the buccal alveolar spaces, and the nasopharynx.

Pemphigus of the mucous membranes, including pemphigus of the conjunctiva with comparatively trivial skin lesions, may be considered in general as a mild form of pemphigus. In generalized cutaneous pemphigus the disease may prove fatal, but this outcome is unusual.

Experimental study. The contents of a vesicle in the mouth of one patient (case 1) was aspirated and diluted with saline solution. This solution was injected into the conjunctiva and into the buccal mucosa of different rabbits, and in the plantar surface of the feet of guinea pigs. The reaction to such injections was negative. Negative reaction was likewise reported in a similar study conducted by Gabriélidès and Ioannidès.[42]

The contents of a vesicle in the mouth of another patient (case 2) was diluted with saline solution and injected intracutaneously into the arm of the same patient. No vesicle appeared at the site of injection.

Pathology. The pathologic changes in pemphigus of the conjunctiva have been studied by Löhlein,[43] Adam,[27] and others. These changes consist of a chronic inflammation of the subepithelium and lymphoid tissue of the conjunctiva leading to the formation of new connective tissue, with subsequent cicatrization. The epithelium of the conjunctiva is transformed into epithelium of the Malpighian type, in which there is epidermatization without keratinization. Adam stresses the fact that vesiculation alone is not the important factor in the formation of subsequent cicatrices.

The histologic study of an enucleated eyeball, the site of pemphigus of the conjunctiva, has been reported by d'Amico,[44] Custodis,[45] and by Smith, Myers, and Lamb.[46] In the last case there was considerable general thickening of the bulbar conjunctiva as a result of dense infiltration with small lymphocytes, plasma cells, and edema near the corneal limbus. Newly formed connective tissue had developed in considerable quantity in thin layers, or in thicker masses throughout the depth of the bulbar conjunctiva near the limbus.

The pathologic changes that occur in

* At one time all bullous eruptions were regarded as pemphigus. This chaotic concept was somewhat clarified by Brocq, who classified pemphigus as follows: acute febrile, fatal; subacute malignant, with extensive bullae; chronic pemphigus (true pemphigus; pemphigus vulgaris); pemphigus foliaceus (Casenave's disease); pemphigus vegetans (Neumann's disease). To this classification of pemphigus some writers add dermatitis herpetiformis (Duhring's disease) and Brocq's enlarged concept of this disease, which he termed dermatite chronique polymorphe douloureuse à poussées successives (Duhring Brocq disease, dermatite polymorphe de Brocq-Duhring). Until more is known regarding the etiology of the disease, there will be no clear distinction between pemphigus and other bullous eruptions, especially dermatitis herpetiformis, toxic erythema bullosa, and severe and variant forms of erythema multiforme.

pemphigus of the conjunctiva do not compare with those changes that take place in pemphigus vulgaris or in pemphigus foliaceus.

A section of conjunctiva removed from one patient (case 4, fig. 5) in the inflammatory stage of pemphigus of the conjunctiva was examined histologically by Dr. Fred Weidman, who reported as follows:

> The conjunctiva was recognizable only as a short strip of epithelium, largely detached from the underlying parts. Its cells were somewhat swollen, but not markedly, and there was only the semblance of edema between them. Elsewhere the surface consisted of a basement membrane (that is, superficial erosion), above which the epithelium was entirely gone. In its place there was a delicate stratum of pink granular detritus which enmeshed a few polymorphonuclears.
>
> The subconjunctival tissue appeared in the form of a narrow zone of granulation tissue. In it the fibroblasts had unusually plump or even round nuclei; there were a few polymorphonuclears. Blood vessels were not conspicuous, but in the deepest parts of the specimen blood vessels were uniformly dilated or even cavernous in places.
>
> *Summary and Discussion.* There was an erosion of the conjunctiva, underlaid by subacute granulation tissue. There was no evidence in this material that the same mechanism was concerned here as in cutaneous pemphigus, although it is conceded that in a position like this, where the bleb was subjected to friction at its very inception, the distinctive features would be promptly removed.

GROUP III. SHRINKAGE OF THE CONJUNCTIVA

This group includes those patients with conjunctival involvement similar to pemphigus accompanying a number of skin diseases, most of which exhibit blebs.

The presence of a bullous eruption following vaccination in children is a well-known occurrence. In our case 12 a bullous eruption followed vaccination at the age of four years. There was ocular involvement that resulted in blindness. We first saw the patient at the age of 28 years, when he presented the terminal picture of pemphigus of the conjunctiva. The conjunctiva was dry and wrinkled, and the cul-de-sacs were obliterated. Both lids were firmly adherent to the globe, and the corneae were opaque. A similar case has been reported by Hardy and Lamb.[10] In Stieren's[47] patient, a boy aged six years, bullous eruption with ocular involvement appeared one month after vaccination.

The second case reported by Hardy and Lamb[10] was that of a colored boy, aged 11 years, who, when one year old, had an eruption resembling mosquito bites on the scalp, legs, and feet. This lasted about two months, and recurred annually during September and October for six years. At the age of three years, the eyes became involved simultaneously with the skin eruption. The condition began with a discharge. The visual acuity in both eyes was reduced to light perception. The cul-de-sacs were shallow and the corneae were opaque. The conjunctiva was dry and wrinkled, and extended onto the cornea for several millimeters all around.

Tillé, Chapuis, and Bory's[48] patient was a man, aged 33 years, whose cutaneous and ocular involvement began simultaneously at the age of 10 years. There was progressive obliteration of the conjunctiva, with repeated attacks of keratitis. Cutaneous involvement was diagnosed as erythrodermia ichthyosiformie of Brocq.*

Shrinkage of the conjunctiva associated with dermatitis herpetiformis (Duhring's disease) has been reported by Redslob,[20] Gabriélidès and Ioannidès,[42] Samuelson,[49] Koutseff,[50] and Nicolas, Rousset, and Colas.[51]† In those cases of

* It is to be remembered that this disease at times manifests bullous lesions.

† See also Riecke, E. Dermatitis herpetiformis. In Jadassohn, J.: Handbuch der Haut- und Geschlechtskrankheiten. Berlin, J. Springer, v. 7: pt. 2, p. 578; Lutz, W. Dermatitis herpetiformis (Duhring). In Schieck, F., and Brückner, A.: Kurzes Handbuch der Ophthalmologie. Berlin, J. Springer, 1932, v. 7, p. 323.

dermatitis herpetiformis with ocular lesions characteristic of pemphigus that we reviewed there was involvement of other mucous surfaces. It is, therefore, difficult to differentiate dermatitis herpetiformis with these ocular lesions from chronic pemphigus with conjunctival involvement, included in our group II.

Cohen and Sulzberger[52] reported the case of a boy, aged seven years, who presented cutaneous and bilateral ocular lesions. The cutaneous lesions were somewhat suggestive of both dermatitis herpetiformis and erythema multiforme. The final diagnosis of epidermolysis bullosa dystrophica acquisita was in accord with the histologic findings. Acute exacerbations of the cutaneous and ocular conditions frequently occurred at about the same time. Shrinking and scarring of the conjunctiva, as well as the symblephara, were comparable to the atrophying and scarring processes that characterize the cutaneous lesions of pemphigus. Cohen and Sulzberger found but seven cases of ocular lesions accompanying epidermolysis bullosa dystrophica recorded in the literature.

Le Roux,[53] von Marenholtz,[54] and de St. Martin[55] reported the occurrence of what characterizes the end result of pemphigus of the conjunctiva—shriveling of the conjunctiva—in patients with congenital syphilis. These observers attributed the ocular conditions to syphilis.

Report of Cases

Group II. Pemphigus of the Conjunctiva

Case 1. Patient of Dr. H. Maxwell Langdon. H. W., a white woman, aged 85 years

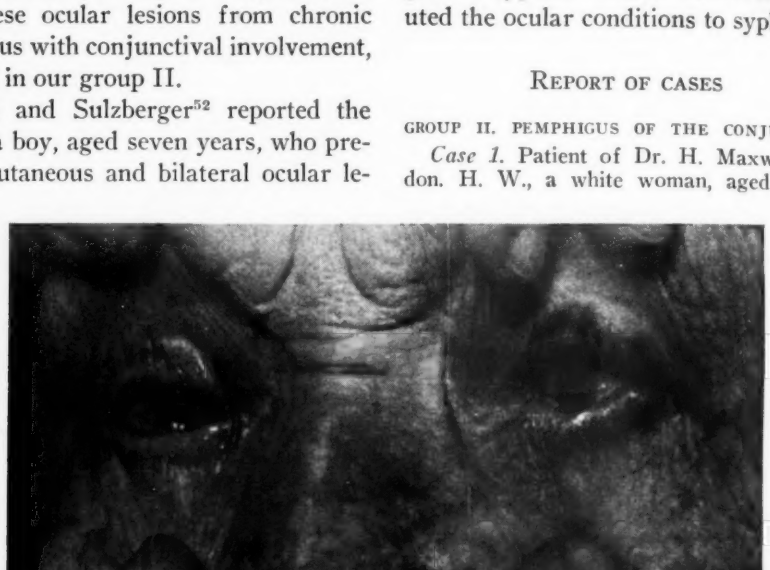


Fig. 1. (Klauder and Cowan). Case 1. Pemphigus of the conjunctiva in a woman aged 85 years, showing considerably narrowed palpebral fissures, adherence of the lids to the globes, and skinlike membrane covering the canthi, especially the inner, by the new skin growth which extends outward beyond the puncta.

(fig. 1). Her first subjective complaints, early in 1937, consisted of smarting of the eyes, redness, and the sensation as of a foreign body. Soon thereafter the vision became impaired and grew progressively worse. Vesicles first appeared in the mouth after a number of teeth were extracted in September, 1937. These disappeared and reappeared, so that the mouth was rarely free of them. Usually a few vesicles or sore areas were present, so that she had been unable to wear artificial dentures. At times there was a sore spot in her nose that caused blood stains on a handkerchief. The skin had never been involved. The administration of Fowler's solution caused the disappearance of the oral vesicles, but they reappeared after the use of the drug was discontinued.

Examination. At various times one or a few vesicles or their remains, taking the form of superficial ulcerations covered with a yellowish membrane, were observed at different places in the mouth. The buccal mucosa was adherent to the outer surface of the alveolar

process on both sides of the mouth. There was scarring of the posterior surface of the pharynx. On several occasions a discrete, encrusted lesion, the size of a pinhead, was observed on the septum. When the crust was removed, the area bled.

Right eye. The skin of the lids was overgrown and continuous, without a break, at both inner and outer canthi, making the palpebral fissure much smaller than normal. At the inner canthus the palpebral fissure started at the puncti. The upper-lid margin was adherent to the cornea for a distance of about 6 mm., starting at a point about 6 mm. from the inner canthus. On both sides of the adherent lid margin the depth of the fornix seemed to be nearly normal. At the point of adhesion the lashes grew down and brushed the globe. The lower lid was adherent to the cornea in a horizontal line about 3 mm. above the lower limbus, and for a distance of about 12 mm. There was a gray membrane overlying the entire inner half and parts of the upper and lower portions of the cornea, leaving a small, relatively clear area externally. Through this portion the iris could be distinctly seen; it was about normal for the patient's age. There were a few subcapsular vacuoles and other signs of incipient senile cataract. The vision equaled 1/60.

Left eye. The lids were completely bound down to the cornea all around, leaving a palpebral aperture 12 mm. long and about 7 mm. wide. The exposed cornea was covered with a cuticular membrane, which presented a surface appearance so like the surrounding skin that it could not be distinguished from the skin of the lids into which it merged. The surface over the entire area of the cornea was skinlike, but was so thin as to be translucent in the center. Under the whole area there were a number of superficial, fairly large blood vessels. Vision was limited to light perception.

Case 2 (figs. 2 and 3). M. G.,* a white woman aged 60 years, was first seen by one of us (J. V. K.) in 1931, and again at intervals until 1933; she was not seen again until 1937, since which time she has been under our observation. According to her history, in about the year 1907, scattered scaly lesions first appeared on the scalp. The condition was diagnosed as lupus erythematosus (at the present time, over the same area, there are large atrophic bald spots, to cover which she wears a wig). Oral lesions first appeared about 1920. During the time she has been under our observation we have discovered vesicles, or their erosive remains, on the buccal mucosa, the inner surfaces of both lips, the tongue, and the hard palate. The patient stated that such lesions had appeared and disappeared since 1920. For the mouth lesions, a physician had advised local applications of silver protein, 25 percent. She had continued to use this solution twice daily for five years. Argyrosis occurred first in 1929, and was marked in 1931.

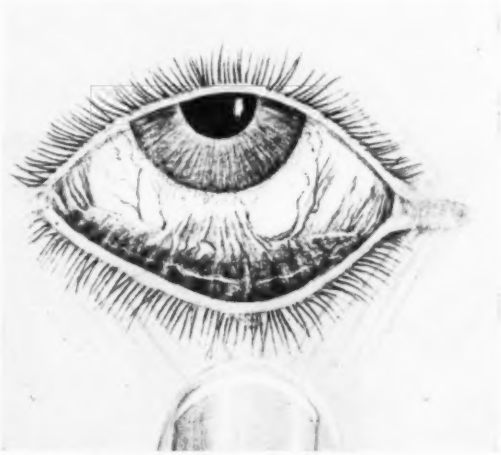


Fig. 2 (Klauder and Cowan). Case 2. Showing the narrow lower cul-de-sac and obliteration of the normal conformation of the inner canthus by the extension of skin, as in case 1. The drawing illustrates the bands of adhesion arising from different levels of the palpebral conjunctiva, but without involvement of the lid margins.

Ocular symptoms first appeared in 1929. The patient complained of reddening and burning of the eyes, a sensation of heaviness of the lids, and a mucoid discharge. At the onset of the disease she was treated for trachoma. Since 1938, subjective ocular symptoms have been absent and the eyes have been quiescent.

She has had "sores" in the vagina, and noticed blood stains on her underwear and on her handkerchief. The urinary stream was disturbed, and urine dribbled over the vulva. At different examinations rounded eroded lesions were observed on the nasal septum and on the mucosa of the anus.

Examination (October, 1940). The alveolar processes were considerably shrunken and had almost disappeared. The teeth were absent. In some places there was union of the buccal mucosa with the mucosa covering the remains of the alveolar processes. The pharynx and nasopharynx were normal. On each buccal mucosa there were linear scars which were cordlike on palpation. There was a scarred area on the left nasal septum.

* This patient was presented before different meetings of the Philadelphia Dermatological Society. Arch. Derm. and Syph., 1933, v. 17, p. 718; 1938, v. 37, p. 687; 1938, v. 38, pp. 151, 988; 1940, v. 42, p. 228.

There was considerable shriveling of the vulva (fig. 3). The labia minora had disappeared, and the entrance to the vagina was greatly narrowed, only one finger being admitted. The urethra was not readily identified; the opening was smaller than normal, and was surrounded with scar tissue. Examination of the mucosa of the anus was negative. Other than argyrosis and the presence of atrophic remains of lupus erythematosus of the scalp, cutaneous examination was negative.

Both eyes. Both lids drooped and the patient presented the appearance of a person having trachoma. All the vessels of the bulbar conjunctiva were engorged and many were markedly tortuous. The palpebral conjunctiva displayed a smooth, velvety surface but, viewed with the slitlamp, there was an independent circulation consisting of tiny spiral loops superficially distributed closely over the entire surface, which was regularly smooth. The anterior chambers were normal in depth and were clear. The irides and lenses were about normal for her age. The retinal arteries were moderately sclerosed.

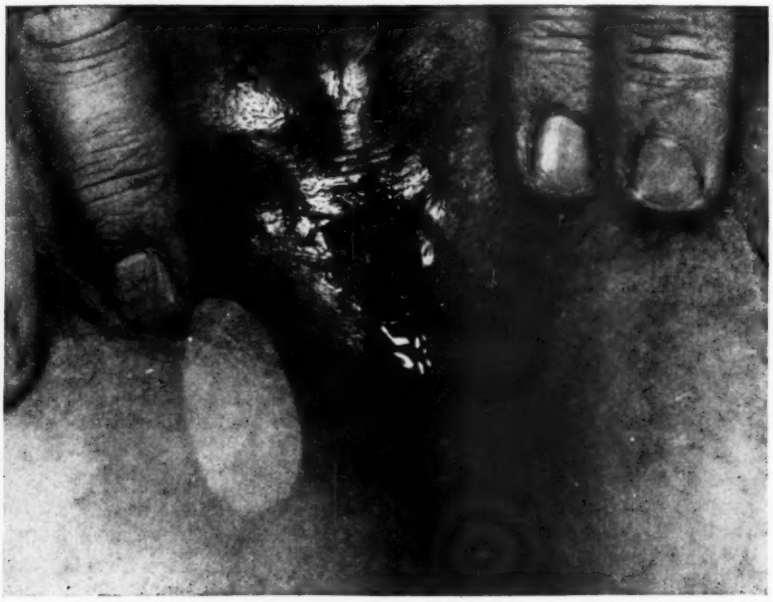


Fig. 3 (Klauder and Cowan). Case 2. Showing atresia of the vagina in the patient with pemphigus of the conjunctiva shown in figure 2. There was involvement of most mucous surfaces.

Right eye. The palpebral fissure was very narrow. Bands of adhesion, extending from different places on the lower lid to the limbus below, tended to lift up the bulbar conjunctiva. The fornix was shallow. Bands, always attached to the limbus, could be produced by pulling the lid in any direction. Fine bands could also be seen under the upper lid but did not lift away from the globe. The skin of the upper and lower lids was continuous over the inner canthus, obliterating the angle and completely covering the caruncle. Anteriorly, the cornea was perfectly smooth and clear in the center, but a narrow grayish border ran all around the limbus; this was irregular in width (0.75 mm. at the widest, except for the crescent formation above, where it was 2 mm. wide), and resembled a pannus. This area had a grayish base, with superficial conjunctival vessel loops that extended over the entire gray base. The posterior portion of the cornea displayed a latticelike, mosaic arrangement of lines of less dense grayish streaks over the entire cornea. The endothelium was about normal. With correcting lenses for a high degree of mixed astigmatism the vision equaled 6/12.

Left eye. The overgrowth of skin at the inner canthus was similar to that in the right eye. The engorgement and tortuosity of the conjunctival vessels were more marked than in the right eye. Stretching of the conjunctiva produced white lines along the traction folds, but no distinct bands otherwise, and this was true of the lower lid only. The cornea was generally clear and did not show the latticelike arrangement seen in the right eye. There was only a slight increase over the normal area of

limbus haze, with extension of vascular limbus loops. The vision equaled 6/15—.

Subsequent examinations disclosed no engorgement and but little injection of the conjunctiva. The eyes felt comfortable.

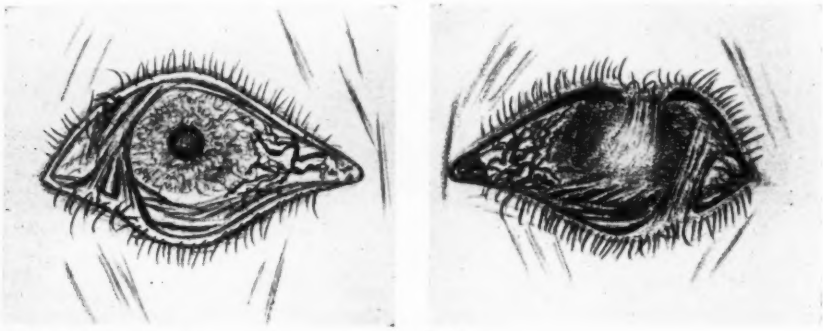
The patient was seen on October 14, 1940, and the manifest refraction was: R.E. —2.50 D. sph. ⊂ +3.75 D. cyl. ax. 110° = 6/12; L.E. —3.00 D. sph. ⊂ +5.75 D. cyl. ax. 80° = 6/15.

Case 3 (fig. 4). M. P., a white woman aged 59 years, was born in the United States of Irish parents. Her first subjective symptoms, which appeared about 1920, were burning of the eyes and a sensation as of a foreign body. At that time a diagnosis of trachoma was made and an operation was performed on each eye, the type of operation being unknown to the patient. Soon after this she complained of poor vision. She first visited the Wills Hospital (service of Dr. J. Milton Griscom) in 1928, at which time the visual acuity of the right eye was 3/60 and that of the left eye 1/60. There has never been any cutaneous nor oral involvement.

Examination (September, 1940). There were no abnormalities of the skin nor of the mucous membranes.

Right eye. The fornix below was shallow and there were two large cicatrized bands that extended from the lid margin to the limbus. There were several other small traction folds. There was a large, thickened band that extended from the outer portion of the upper lid down to and over onto the cornea at about the 11-o'clock position. The fornix from the external canthus to the band was very shallow. The bulbar conjunctival vessels were greatly injected.

The cornea was infiltrated throughout, but the infiltration was more marked around the periphery. It was irregular, largely superficial, but often extended deep into the cornea proper. There were no sharp lines of demarcation at the edges of the infiltrated areas. The surface of the cornea was uneven. As a whole, the cornea was exceedingly thin, measuring only 0.1 mm. in places. Many blood vessels extended onto the cornea all around the limbus. Most of these were superficial, although some ran into the deeper layers. The endothelium was intact. The iris and lens were about normal for the patient's age.



Right eye Left eye

Fig. 4 (Klauder and Cowan). Case 3. Pemphigus of the conjunctiva showing broad bands of adhesion from the lid margins to the globe. The cornea of the left eye is entirely covered by a skinlike membrane, with greasy surface, which wrinkles exactly as normal skin does. Immediately beneath this many blood vessels can be seen. The cornea of the right eye is extremely thin, measuring less than 0.1 mm. in thickness in some points. The thickness varies on account of the irregularity of the anterior surface.

Left eye. The center upper-lid margin was bound onto the cornea for a distance of approximately 6 mm., just below the upper limbus. There was a fairly deep fornix under and on each side of the attachment. Below, the palpebral conjunctiva was attached to the globe for its entire length, so that the inner surface of the lower lid was not more than 5 mm. at its widest part. A broad band extended from a point on the outer side of the lower lid to the limbus at about the 4-o'clock position and to the outer half of the globe. The cornea was entirely covered by a thin, pale, skinlike membrane that was of the same consistency as the skin. The surface was greasy, scaly, and wrinkled, like normal, thin skin. It seemed loosely attached over most of the underlying cornea. It was translucent, so that numerous blood vessels could be seen lying between it and a very thin, opaque cornea beneath. The blood vessels of the conjunctiva were full and

tortuous. There was a wide area of intensely injected ciliary vessels around the limbus.

Case 4 (figs. 5 and 6). Service of Dr. Warren S. Reese, Wills Hospital. C. H., a Hebrew, aged 62 years, was born in the United States, his grandparents having been born in Germany. His first complaint was of "sores" in the mouth, which appeared two years prior to the time we first saw him (1929). The "sores" appeared and disappeared, and at times were absent for as long as four months. The patient did not know whether blisters had occurred in the mouth. The first ocular symptoms appeared about three months after the oral involvement. He complained of redness and burning of the eyes, and the discharge of a thick, ropy, lacrimal secretion. Later the vision became blurred. He has had slight nosebleeds. He denied ever having had a skin eruption.

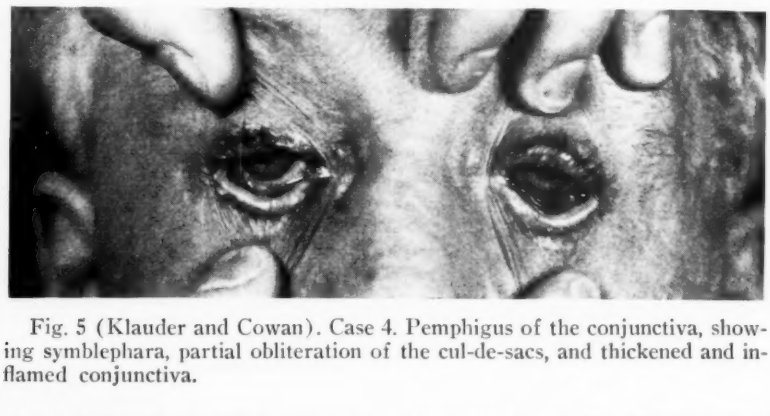


Fig. 5 (Klauder and Cowan). Case 4. Pemphigus of the conjunctiva, showing symblephara, partial obliteration of the cul-de-sacs, and thickened and inflamed conjunctiva.

Examination. Erosive, crusted lesions were seen on both sides of the nasal septum. In the mouth, a number of small, eroded lesions, covered with a yellowish membrane, were observed, and a few vesicles were present on the buccal mucosa. One such vesicle is shown in figure 6. There was no involvement of the urethra nor of the anus. Except for scattered lesions of vitiligo there was no cutaneous involvement.

Both palpebral fissures were small. The lid margins were brawny red and thickened, with ulcerative blepharitis. There were slight eversion of the upper lids and entropion of the lower lids, with several displaced cilia irritating the corneas. The general appearance was that of ptosis.

Right eye. The lower palpebral conjunctiva was inflamed and thickened, the cul-de-sac was nearly obliterated, and numerous traction bands extended from the lid to the eyeball. The conjunctiva of the upper lid was not so badly thickened as the lower, but the lid could not be everted. There was a stringy, yellow, mucoid discharge. The cornea was generally moderately infiltrated, but there were numerous dense areas, mostly superficial. The surface was slightly irregular. There was some epithelial bedewing. The iris was normal. The lens showed well-advanced senile changes. The vision was 6/21.

Left eye. The conjunctiva, both above and below, resembled that of the right eye. There were several symblephara, one small one being attached to the lower limbus. The cornea was similar to that of the right eye, but there were numerous blood vessels that came in

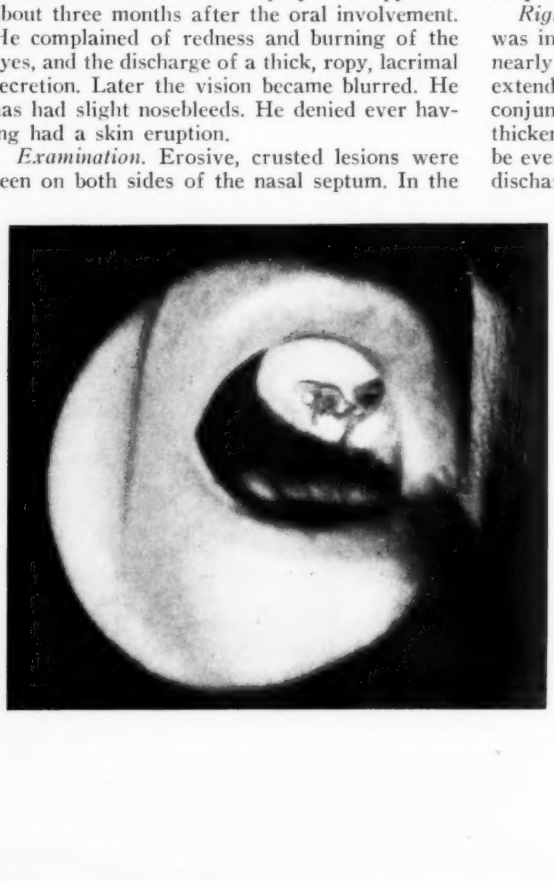


Fig. 6 (Klauder and Cowan). Case 4. Showing an erosive area, the remains of a vesicle on the buccal mucosa of the patient shown in figure 5, and also unruptured vesicles.

from the limbus at about the middle layers. The appearance of the iris and lens was about the same as that of the right eye. The vision equaled 6/30.

Case 5. Patient of Dr. Carroll Mullen. C. L., a white woman aged 66 years. Her only complaint was of irritability of both eyes, occurring at irregular intervals for about five years. At such times her eyes became red, and she had a burning and itching sensation. Each attack lasted from three to four weeks. A diagnosis of pemphigus had been made about 14 months prior to the time that we first saw her. The history did not suggest involvement of the skin or mucous membranes.

Examination. No lesions of pemphigus on the skin or the mucous membranes were apparent.

Right eye. The upper lid appeared normal. The conjunctiva of the surface was smooth and healthy. The margin of the lower lid was fixed and immovable on the globe, 4 mm. below the limbus, and this extended from the external canthus to a point about 10 mm. from the inner canthus. Traction folds extended from the attachment of the lid margin to the limbus for the entire distance of the lid. Where the lid margin was free, the cul-de-sac was of moderate depth. There was some trichiasis of the lower lid. The vessels of the bulbar conjunctiva were full and tortuous. The cornea was irregular, and contained infiltrations of varying density in different places throughout its entire thickness. Above, there was a gray superficial infiltration forming a pannuslike crescent, 3 mm. at its widest, with numerous extensions of limbal blood vessels over the surface. Another, narrower crescent of the same type extended along the lower limbus. There was considerable endothelial dystrophy. The anterior chamber was of normal depth. The iris was normal for the patient's age. The lens showed beginning senile sclerosis, and contained considerable pigment deposit scattered over the anterior surface. The vision equaled 6/15.

Left eye. The condition was similar to that of the right eye, but the lid margin was fixed along the globe for its entire length at a level of about 3 mm. below the lower limbus, with traction bands extending to the limbus. The vision was 6/12.

Case 6. Patient of Dr. Carroll Mullen. The patient was a Hebrew, aged 72 years, born in Russia. He complained of smarting of the eyes with lacrimation, which had occurred at intervals for about 30 years. He had never had an eruption nor sores in his mouth.

Examination. There was no involvement of the skin or mucous membranes.

Right eye. The palpebral fissure was considerably narrowed, measuring about 10 mm. at its widest point. On pulling the lower lid down, three traction bands could be seen to extend from just within the lid border to the lower portions of the limbus. The fornix was very shallow. The tarsal cartilage above was narrower than normal, but the fornix was about normal in size and only on making considerable traction could a few small bands be seen to stretch from the conjunctiva of the lid onto the globe near the limbus. The cornea was generally infiltrated, and there was a wide, pannuslike, vascularized crescent above. It resembled and exaggerated arcus senilis and extended from the limbus to a point below the center of the cornea; it was the shape of a wide crescent, with irregular edges and very fine superficial blood vessels coursing over it. The vision was 6/15+

Left eye. The left palpebral fissure was smaller than the right—about 7 mm., vertically, at its widest point, and 15 mm. horizontally. The skin of the lids extended over both angles, particularly over the inner. The contraction bands were more marked, the lower fornix was more shallow, and the tarsal cartilage of the upper lid was smaller than those of the right eye. There was considerable gray superficial infiltration over the cornea, particularly over the upper portion, which extended down from the limbus to a point below the center. On this base a number of superficial blood vessels were observed, the whole presenting a pannuslike appearance. Vision served to detect fingers at one foot.

Case 7 (fig. 7). M. S.,* a white woman aged 69 years, born in Germany, was under observation in 1930 (service of Dr. J. Milton Griscom, Wills Hospital). At that time the history stated that 15 years previously an operation for trachoma had been performed on both eyes. The patient complained of a burning sensation in the eyes and impaired vision, which had existed in the left eye for five years and in the right eye for three years prior to 1930. She had had a sore throat for several years, but denied ever having had any skin lesions.

Examination. The mucous membrane covering the posterior pharynx was dry, and fused with the posterior pillars of the tonsils and with most of the soft palate; the uvula was obliterated. There remained only a small opening between the soft palate and the nasal spaces. There was no involvement of the skin nor of other mucous surfaces.

The upper and lower portions of the corneas

* This patient was presented at a meeting of the Philadelphia Dermatological Society. Arch. Derm. & Syph., 1931, v. 23, p. 1142.

were covered with a dry, skinlike membrane, the cornea of the left eye being affected more than that of the right. The cul-de-sacs were obliterated. The entire upper-lid margins were adherent to the globes. Visual acuity in the right eye was 6/21; in the left eye, ability to count fingers at one foot.

The patient has not been seen since 1930.

Case 8. A. R.,* a white woman, aged 68 years, born of American-born parents, first visited Wills Hospital (service of Dr. J. Milton Griscom) in July, 1937, complaining of lacrimation, redness, and "soreness" of the eyes. These symptoms had first appeared one year before. Visual acuity was 6/30 in the right and 6/9 in the left eye. Her second admission to the Hospital was in April, 1938. At that time the subjective ocular symptoms were unchanged, the eyes having remained quiet. The visual acuity in the right eye was limited to light perception, and in the left it was 6/30. There was no history of lesions involving the skin or mucous membranes, and none were seen on physical examination.

Examination: Right eye. The upper lid drooped. There was a large symblepharon at the inner canthus, involving both lids, the caruncle, and the semilunar fold. This extended over the globe and was attached around the limbus. Cicatrized bands of conjunctiva extended from the upper and lower lids to the limbus all around. The fornices were moderately reduced. The conjunctiva covering the globe was thin and redundant. The conjunctival vessels, particularly those around the limbus, were engorged and extended onto the cornea; some were deep but most were superficial. The cornea was generally infiltrated throughout, especially around the periphery, the temporal half being most affected. The central portion of the cornea was relatively clear. There were many fine brown and gray posterior precipitates, and the aqueous contained many cells. The iris was trophic, with considerable proliferation of pigment around the pupillary border. In places the retinal pigment layer was stripped from the stroma and attached to the lens. There was a very thin, grayish, membranous deposit over the surface of the lens. The vision equaled 6/30.

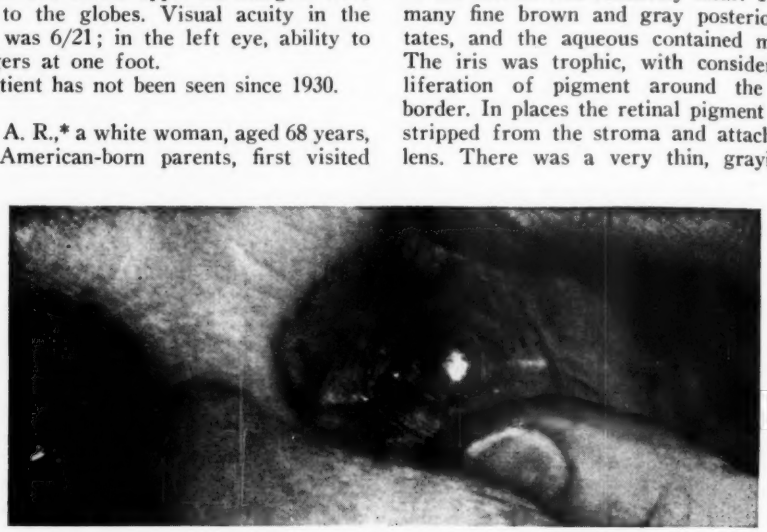


Fig. 7 (Klauder and Cowan). Case 7. Complete symblepharon with obliteration of the cul-de-sacs. Extensive bands can be seen extending over on to the globe. The cornea is entirely covered with a skinlike membrane.

Left eye. The upper lid drooped as did that of the right eye. There was one band of adhesion from the upper-lid margin to the globe, and another from the inner canthus, involving the caruncle and the semilunar fold. The cornea, aqueous, iris, and lens were about normal for the patient's age. The vision equaled 6/9.

Case 9 (fig. 8). O. K.,† a man aged 57 years, was born in Turkey. He first visited Wills Hospital (service of Dr. J. Milton Griscom) in 1937. Twenty years prior to this the left eye had become inflamed. This condition soon disappeared and did not recur. His vision gradually became blurred. There had never been involvement of the skin or of other mucous surfaces.

Examination. There were no lesions of pemphigus except those found in the eyes.

Right eye. The lids were slightly thickened and the palpebral fissure was small. The conjunctiva seemed grossly normal, but, on pulling the lower lid down, fine traction lines and points of adhesion to the globe could be observed. The

* This patient was presented at a meeting of the Philadelphia Dermatological Society. Arch. Derm. & Syph., 1938, v. 38, p. 988.

† This patient was presented at a meeting of the Philadelphia Dermatological Society. Arch. Derm. & Syph., 1938, v. 73, p. 364.

cornea, iris, and lens were normal for the patient's age. The vision equaled 6/12.

Left eye. The lids were thickened, and the palpebral fissure was smaller than that of the right eye. The conjunctiva was dry and contracted, and presented many small traction folds extending from the palpebral surfaces to the globe, all ending at the limbus. The upper fornix was shallow, and the lower one considerably so. The cornea was generally flattened, very thin, and the entire surface was covered by a characteristic translucent membrane resembling the skin. Beneath this the nearly opaque cornea was seen to contain numerous blood vessels. The iris and lens were not sufficiently visible to make description possible. The vision sufficed only to detect hand movements.

Fig. 8 (Klauder and Cowan). Case 9. Appearance of the patient after 20 years. The right eye was almost free from any signs of disease. The left eye showed a late stage of pemphigus—shallow fornices, traction bands, and a thin, translucent cornea, covered with a characteristic skinlike membrane.

Case 10. Patient of Dr. Thomas H. Cowan. The patient was a man aged 64 years, born in Italy. He was first admitted to the Philadelphia State Hospital (an institute for the indigent), in 1933, because of poor vision and symptoms of senile dementia. At that time pemphigus of the right eye was diagnosed. The left eye had been enucleated because of an injury 20 years prior to admission. No information concerning the onset of pemphigus of the right eye could be obtained from the patient or his relatives.

Examination. The skin and mucous membranes showed no evidence of pemphigus.

Right eye. The skin of the lids appeared to be normal except at the inner and outer canthi where slight contraction, due to a moderate degree of blepharophimosis, had occurred. An almost complete symblepharon was present. The upper lid was adherent to the eyeball throughout its entire length at the level of the upper limbus, and no cul-de-sac was present. The lower cul-de-sac was only a few millimeters in depth, and the lid closed only to the level of the lower limbus. The lids, therefore, could not close entirely, and the palpebral fissure had a constant width of about 12 mm.

The bulbar conjunctiva and the corneal epithelium were similar in appearance, having a dry, skinlike texture, a gray, translucent color, and a smooth, dull surface. It was rather loosely attached to the underlying surfaces, and traction brought into view numerous bands in the subconjunctival tissue as well as delicate wrinkles in the conjunctiva itself. Many fine blood vessels could be seen beneath the epithelial surface. The globe was normal in size and shape, but none of the inner structures were visible. The vision equaled light perception.

Left eye. So far as could be ascertained, the left eyeball had been removed 32 years before, following an injury. The skin of the lids appeared to be normal, except at the canthi, where slight blepharophimosis had occurred, with resulting traction folds in the skin. As in the right eye, the lid margins could be held open about 12 mm. The conjunctiva of the lids and socket had contracted greatly, running directly from the upper to the lower palpebral margin, so that only a millimeter or two of the upper and lower cul-des-sacs was present. Its appearance was like that in the right eye.

Case 11 (fig. 9). Patient of Dr. Carroll F. Haines. The patient was a white woman aged 55 years. About three years prior to the time we first saw her, in November, 1940, the right eye had become red. The patient had had a sensation as of a foreign body in the eye. About one year later the left eye became red. She first noticed impaired vision about September, 1938, and, by December, 1938, she could not see to read. "Sores" first appeared in the mouth in March, 1938, and an eruption of blebs occurred on the face later—about July, 1938. The blebs on the face were always few in number and localized to each side of

the nose. They appeared and disappeared, leaving encrusted areas. This has continued since the onset of the condition. Soon after July, 1938, "sores" appeared in the vagina, and since January, 1941, there has been a recurring outtive remains of blebs. Similar lesions were sparingly scattered over the arms and legs and on the dorsum of each hand. The lesions on the face are shown in figure 9.

Examination of the eyes (March, 1941). The

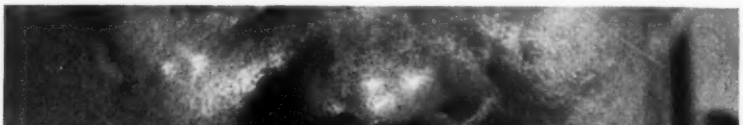


Fig. 9 (Klauder and Cowan). Case 11. The skin lesions shown in this illustration appeared about a year after the ocular symptoms were first noticed and have been present to some extent ever since.

break of vesicles on the arms and legs. The patient is losing weight and is failing in strength.

Examination (March, 1941). On the buccal mucosa there were many erosive areas, covered with a yellow membrane. The posterior portion of the alveolar process on the right palpebral fissure of the right eye was small. The fornices above and below were shrunken, and the conjunctiva of the globe was cicatrized. The cornea presented an irregular surface, was very thin in many places, and was infiltrated throughout. No view of the iris could be obtained. There were no symblephara

Fig. 10 (Klauder and Cowan). Case 12, Group III. Showing ankyloblepharon and a skinlike membrane covering the corneas. At the age of four years both eyes became inflamed, and the patient had a generalized bullous eruption following vaccination.

side was attached to the buccal mucosa by scar formation. There was no involvement of the pharynx. On the right side of the nasal septum there were a few small encrusted areas. The vagina was uninvolved. The urethra appeared normal on external inspection. There were a few, bright-red, small, erosive lesions on the anal mucosa. On the face, localized to each side of the nose, there were blebs surrounded by normal skin, encrusted lesions, and the congesnor cicatricial bands of any kind. Dr. Haines stated that there had been several bands which he severed. According to him, the reason for their nonappearance was the fact that the patient had been wearing a contact lens since the operation. The vision equaled light perception.

The lids of the left eye were adherent along the edges to such an extent that the palpebral fissure could be stretched to a size of only 6 by 11 mm. The cornea was almost entirely

opaque, but was not covered with the characteristic keratinized membrane. The eye was blind.

GROUP III. SHRINKAGE OF THE CONJUNCTIVA

Case 12 (fig. 10). R. S., a white man aged 27 years, was born in the United States, of Italian parents. He was first seen at Wills Hospital in 1938 (service of Dr. Frank Parker). At the age of four years both eyes became inflamed, and at the same time a generalized eruption of vesicles appeared after vaccination. He had been blind ever since, and could not remember having ever been able to see. There was no subsequent eruption.

Examination. The patient was in good health and showed no cutaneous nor mucous-membrane involvement.

The eyelids of both eyes were firmly adherent to the globe along their entire length. The attachment was about half way over the upper half of each cornea and just over the limbus below. There was considerable limitation of movement of both lids and eyeballs, the lids opening only about half way. There was no evidence of canaliculi in either eye. The entire exposed portion of the globes was covered with a thin, integumentlike membrane that was an extension of, and identical with, the epidermis of the skin of the lids. The corneas were visible beneath. The vision equaled light perception.

1934 Spruce Street.
1930 Chestnut Street.

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THE PRACTICAL APPLICATIONS OF GONIOSCOPY TO GLAUCOMA SURGERY*

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Since publishing the results of gonioscopic studies of a large number of glaucoma cases, I have been impressed with the frequency with which the average ophthalmologist views gonioscopy either as a research technique or as a method of diagnosing the various diseases manifesting the common symptom of glaucoma. That gonioscopy is not a research technique is attested by its clinical use by many of the leading ophthalmologists in the United States. That it is of no diagnostic value in cases of so-called primary glaucoma has been shown by previous studies,[1] but this does not necessarily destroy its great importance. It has no value in establishing the diagnosis in cases of suspected glaucoma simplex. Nor is it of diagnostic value in established cases of either glaucoma simplex or acute glaucoma in the congestive phase in eyes that have not been operated on, since, in the latter pathology, the epithelium is too edematous for observation. Only in certain cases of mild acute glaucoma, in which the tension has returned to normal and in which the angle is visible, is gonioscopy of diagnostic value. Its chief advantage as to diagnosis is in cases in which there are other forms of glaucoma, ordinarily classified as secondary.

Aside from its diagnostic limitations and its value in leading to our better understanding of the diseases included under the term glaucoma, gonioscopy is of greatest importance to the ophthalmic surgeon. To him gonioscopy is the only accurate means whereby he can criticize his own surgical results, thereby leading to improvement in his surgical technique and results. It is also of value to him in indicating the best location for drainage when synechiae are present, both in eyes that have and that have not been previously operated upon.

Barkan has recently published a paper[2] on the choice of operation in glaucoma surgery, a modified republication of his paper published in 1939 in the Transactions of the Pacific Coast Oto-ophthalmological Society, which I had hitherto overlooked. In that paper he discussed the types of operative procedures to be used in early or late stages of the two types into which he divided so-called primary glaucoma. As background for elaborating my own views of the surgical procedures to be used in the various forms of glaucoma, based on gonioscopic studies, and for comparing these views with those of Barkan, I should like first to discuss both Barkan's and my own classifications of glaucoma.

CLASSIFICATIONS OF GLAUCOMA

Both Barkan's and my own classifications, as well as one previously made by Raeder in 1923 (see Barkan[3]), differ from the generally accepted classification of glaucoma in that they consider so-called primary glaucoma to be divided into two groups, based on the depth of the anterior chamber and angle. Raeder based his classification upon anterior-chamber measurement while Barkan's and my own are based on gonioscopic observations and refer more particularly to subdivision according to the depth of the angle. The generally accepted classification into acute

* From the Illinois Eye and Ear Infirmary. Under a grant from the Kellogg Foundation of Battle Creek, Michigan.

congestive, chronic congestive, and simple glaucoma is based entirely on clinical appearance. The fundamental inaccuracy of this division is the consideration of congestion as a diagnostic criterion. Both Barkan[3] and I[4] have discussed the fallacy of considering vascular compensation or decompensation as other than phases in the course of any of the diseases grouped under the term *glaucoma.*

For the purpose of overcoming minor differences in the classifications proposed by Barkan and by me, so that both may be used together in the inevitable trend toward changed ideas about glaucoma, it would be well to compare the two classifications. Barkan subdivides so-called primary glaucoma into trabecular (or wide-angle) glaucoma and narrow-angle (or iris-block) glaucoma. He considers the trabecular type to correspond to glaucoma simplex and to include "pigment glaucoma," "glaucoma senile," glaucoma capsulare, and those normal-appearing angles in which the glaucoma is probably "due mainly to disturbances in secretion, either in amount or in composition, or to a relative reduction in permeability of the trabeculum on a congenital basis." He states that narrow-angle glaucoma is the "pathologic entity that underlies most cases of so-called chronic congestive glaucoma," from which attacks of acute glaucoma result. The term, *trabecular glaucoma,* in my opinion, is inaccurate, since most cases appear to be what Barkan calls "glaucoma senile," of which at least some are due to arteriosclerosis of the afferent vessels to Schlemm's canal (Friedenwald[5]), which do not involve the trabecula at all.

One other point that I wish to emphasize in regard to Barkan's classification is that he divides the narrow-angle group, corresponding to so-called chronic congestive glaucoma, into early cases, without synechiae, and late cases, with synechiae. Actually, synechiae never form in shallow-angle glaucoma except in the presence of congestion, so that in the late cases of so-called chronic congestive glaucoma there must have been congestive episodes, and these as a group would find a more logical place under *acute glaucoma.* In a previous paper[4] it was pointed out that the majority of cases of acute glaucoma begin without vascular congestion, but that, after a varying period ranging from several hours to days, the eye becomes red and painful because the vascular system of the eye can no longer tolerate the acute ocular hypertension. During the noncongestive phase the disease entity is still actually acute glaucoma. If episodes of acute glaucoma, in the noncongestive phase, recur repeatedly and subside without entering the congestive phase, we consider the condition to be the so-called chronic congestive form of glaucoma, whereas it is actually a recurrent form of ordinary acute glaucoma. If episodes of acute glaucoma are allowed to recur often enough, the eyes in all such cases will enter the congestive phase. Thus, the classification should not differentiate early and late narrow-angle glaucoma from the acute-glaucoma phase. To illustrate the oneness of the "chronic-congestive-glaucoma"–acute-glaucoma group a summary of the clinical picture of acute glaucoma will not be irrelevant.

The clinical picture of acute glaucoma

The actual onset of acute glaucoma, when this is due to pupillary dilatation, ciliary-body congestion, or accommodation,[4] is scarcely noticed by the patient. Blurring of vision in prepresbyopic or early presbyopic eyes may be present as a result of interference with ciliary-muscle function. Occasionally the onset is associated with the presence of colored halos. Irritation of the conjunctiva and slight pain in the head or eye may also be attendant symptoms. Usually these last about a half to two or

three hours and subside entirely, only to recur again at varying intervals, becoming more frequent, and lasting longer as time goes on, each attack leaving anatomic conditions more favorable for further attacks. Slight circumcorneal injection, if any, is associated with these episodes.

Occasionally patients relate that they can relieve these symptoms by the use of hot or cold applications or by looking at a bright light for several minutes, or by sleep.

Ultimately, one of these mild episodes will persist longer than usual, and suddenly the patient will experience marked diminution in vision, photopsia, swelling and redness of the conjunctiva, and severe pain in the head and eyes, often so severe as to cause nausea and vomiting. The sudden change in symptoms often awakens the patient from sleep and occurs without any precipitating factor; for it is an aggravation of the previous mild symptoms induced by a break in the vascular equilibrium of the eye, as a result of the continued high intraocular pressure. Probably an accumulation of tissue metabolites within the eye, when drainage of intraocular fluid is impeded, causes the vascular decompensation. At any rate the sudden aggravation of symptoms is attributable to the combination of high intraocular pressure and increased permeability of the vascular walls.

In some cases the first mild, noncongestive episode of acute glaucoma is followed by the congestive phase. If early treatment with miotics is instituted, even the congestive phase subsides rapidly; but if the patient does not use miotics as a prophylactic measure, recurrence is probable, again by way of the noncongestive phase. What previously has been called the prodromal stage of acute glaucoma is in reality the noncongestive phase of the disease.

Objectively, the tension may not be different in the noncongestive and congestive phases. It is usually very high in the latter, since such factors as increased aqueous protein content become effective in addition to the mechanical obstruction of the angle.

Shallowness of the anterior chamber is typical of this type of glaucoma, but the depth is not different from that in eyes of individuals who do not have glaucoma but who are predisposed to the disease. It has been shown, moreover, that the chamber depth does not decrease when the congestive phase is entered.

The vascular decompensation produces not only chemosis of the conjunctiva but edema of all the ocular tissues. The corneal epithelium is so involved that fundus details are obscured. Blebs and vesicles appear on the cornea, which loses its sensitivity. In the noncongestive stage, even in the presence of very high intraocular pressure, the cornea is not edematous, and arterial pulsation is easily observed in the fundus.

The pupil is dilated in both phases of acute glaucoma but is irregular in the congestive phase. The dilatation, when not in itself the actual etiologic factor at the onset of the disease, is probably due to slight stretching of the eyeball and to the pressure effect on the nerves. In rabbits, if a needle, attached to a syringe containing water, is inserted into the anterior chamber and the pressure increased, the pupil dilates, contracting when the pressure is decreased. Barkan suggests that the vertically oval shape of the pupil is due to anatomic narrowness of the angle above. Undoubtedly, in the congestive phase, the blood supply to a few of the nerve fibers to the sphincter is affected irregularly, resulting in irregularity of the pupil.

The iris in the congestive phase becomes muddy and discolored. Some of the iris vessels become visibly distended. If the congestive phase persists for any length of time, fine posterior synechiae may form.

The nerve head, in the noncongestive phase, is normal. In the congestive phase, it is red, but not excavated. If repeated attacks occur, or if an attack persists, the disc becomes rather rapidly excavated.

Biomicroscopy reveals abnormalities only in the congestive phase. Edema of the epithelium, blebs, and vesicles are seen. In this phase the contents of the anterior chamber and the iris vessels are difficult to see clearly.

In the noncongestive phase, gonioscopy reveals closure of the chamber angle. In the congestive phase its closure must be presumed since the cornea is too cloudy to render the angle visible.

In individuals in whom a congestive attack is relieved spontaneously, or with miotics, floating particles of pigment, irregularity of the pupil, occasional fine posterior synechiae, and pigment on the posterior corneal surface are observed. Slight persistent pericorneal injection may be present. If a patient is seen for the first time after such an attack, the tension in the eye is usually below normal and an erroneous diagnosis of acute iritis may be made.

When the congestive phase of glaucoma has been allowed to go on without treatment, the eye eventually becomes blind and enters the stage common to all types of glaucoma, called absolute glaucoma. The eye remains injected, the episcleral veins dilated; vesicles form on the cornea, and the iris becomes muddy. Pain persists. Gradually, the vascular system adjusts itself somewhat, and the eye often becomes less painful.

The classification of glaucoma which I have suggested is shown in chart 1.

In this classification, the groups corresponding to the older classifications, such as "primary glaucoma," including glaucoma simplex, acute congestive glaucoma, and chronic congestive glaucoma, are noted for the sake of comparison. In the newer classification, the only cases listed as primary are known as chronic simple glaucoma (for lack of a better designation and because of usage). At least a portion of the cases now considered in this category are probably due to arteriosclerosis (Friedenwald), while another portion is probably the result of marked pigment deposit in the trabecular spaces (Barkan). These exceptions, and all other types of glaucoma, are considered to be secondary.

Surgical considerations

As previously stated, the most important practical use of gonioscopy for the ophthalmic surgeon is in enabling him to make postoperative observations of glaucomatous eyes. The practical surgical considerations derived from gonioscopic observations will first be discussed; then Barkan's surgical indications will be compared with my own suggestions in selecting the operation suited to the various types of glaucoma.

Iridectomy. It has been previously pointed out[1] that the primary effect of

CHART 1

Suggested etiologic classification of glaucoma

A. Primary or Idiopathic Glaucoma—*Chronic Simple Glaucoma* (except those cases listed below under arteriosclerosis or under pigmentary obstruction)

B. Secondary Glaucoma

1. Failure of osmotic forces
   - (a) *Arteriosclerosis* of afferent vessels to Schlemm's canal (Friedenwald)
   - (b) Obstruction of the trabecular spaces—
     - (1) *Glaucoma capsulare*
     - (2) *Pigmentary obstruction*—when marked pigment deposit is present
     - (3) Blocking of trabecular spaces by cellular debris in cases of *iridocyclitis*, active and healed
     - (4) Blocking by *tumor growth*
   - (c) Increased protein in aqueous—*severe uveitis*
   - (d) Vascular changes in angle due to toxic effect of severe retinal-vitreous hemorrhage—*central-retinal-vein occlusion* and probably in *diabetic rubeosis*

   These correspond to the glaucoma-simplex group of the older classification

2. Mechanical closure of the chamber angle by the iris
   - (a) Shallow-angle glaucoma
     - (1) *Acute glaucoma* including the recurrent form which formerly was called "chronic congestive glaucoma"
     - (2) *Acute glaucoma due to lens intumescence*

     This type corresponds to acute and chronic congestive glaucoma of the older classification
   - (b) *Glaucoma following cataract surgery* (in this type the chamber is deep, the angle blocked)—*Aphakic obstructive glaucoma*
3. Irritation of ciliary processes in cases of *lens dislocation* (*posterior*)
4. Lack of communication between the anterior and posterior chambers
   - (a) *Seclusio pupillae*
   - (b) *Total posterior synechia*
5. Obstruction of venous drainage in experimental and clinical glaucoma following *vortex-vein obstruction* and in cases of *pulsating exophthalmos*
6. General vascular hyperemia—including the hyperemia and changes following *concussion* (*traumatic glaucoma*) and the histamine-like reaction of *epidemic dropsy*
7. Congenital anomalies
   - (a) *Hydrophthalmos*
   - (b) *Juvenile glaucoma*
   - (c) Associated with *nevus flammeus* or with *neurofibromatosis*

iridectomy is the opening of the chamber angle or the production of a filtering cicatrix. The latter effect is the usual criterion of a successful iridectomy in cases with complete and permanent closure of the chamber angle.

Gonioscopic observations indicate that, when iridectomy is performed early in the course of the congestive phase of acute glaucoma, before dense adhesions have formed, part of the closed angle is opened and the tension is reduced. If the operation is done after dense adhesions have formed, it is unsuccessful except when filtering cicatrices form.

During the interval between attacks of acute glaucoma, or after relief from an attack by the use of miotics, iridectomy is the procedure of choice, since here the angle is at least partly open. The iridectomy, particularly if basal, would assure the persistence of an area of normal, unobstructed trabecular spaces. It may also be used prophylactically in patients who have repeated episodes of acute glaucoma, in the noncongestive phase, and for the same reason. Early in a congestive attack of acute glaucoma it would serve also to open the angle if the adhesions are not too firm. Late in a congestive attack, it is suggested that it might be well to combine the iridectomy with a partial iris inclusion. The ab externo approach is to be preferred, since this may help in insuring the formation of a filtering cicatrix by promoting the incarceration of iris tags in the wound.

Cyclodialysis. Vannas,[6] Barkan,[7] Sugar,[1, 8] and Clarke[9] have submitted gonioscopic evidence for the truth of what I have called an "all-or-none" relation between success of cyclodialysis and the formation of a supraciliary cleft in eyes operated on by this procedure. If a cleft of any size is present, the tension is reduced to normal; if none is visible, the tension remains uncontrolled. In eyes which have recently been operated on, in which the cleft is not visible, the tension may remain normal for an average of about six weeks, postoperatively, but will always eventually resume its previous height. Thus gonioscopy is of definite prognostic value to the surgeon who performs the operation.

Gonioscopic observations further indicate that the cyclodialysis operation should not be used in eyes in which further intraocular surgery is contemplated, since the latter usually closes the cyclodialysis cleft and requires repetition of the operation.

Most failures of well-performed cyclodialysis operations are due to the persistence and organization of a blood clot in the aperture of the cyclodialysis cleft. Three modifications of the classical cyclodialysis procedure have therefore been used by me. First, the extent of sweep of the cyclodialysis spatula is decreased by about one half, to avoid excessive trauma and hemorrhage. Second, the horizontal meridian of the eyeball is carefully avoided, not only to prevent hemorrhage from severance of the long posterior ciliary vessels which lie there, but to avoid painful pull on the nerves and nerve loops that are also there. Third, eserine salicylate is used immediately postoperatively and thereafter, to help keep the cleft open. Another aid is the performance of the operation in one of the upper quadrants and keeping the patient propped up in bed, postoperatively, as suggested by Gradle, in order to keep blood out of the cleft when hemorrhage does occur.

Elliot trephining. Trephining operations, like all fistulizing operations, depend on the subconjunctival drainage of

intraocular fluid through a scleral channel unobstructed by iris, ciliary processes, lens, or scar tissue. Obstruction of outflow through the trephine opening is often due to the unsuitable placing of the opening. Its correct placement requires a knowledge of the varying amounts of scleral overlap around the corneal circumference. Lagrange's figures of 1.75 mm. of overlap above, 1.45 below, and 1.0 mm. at the sides, indicate that a trephine opening properly placed above would be too far back if made at the same position on either side. Similarly, if the angle is closed by adhesions, preoperatively, the trephine opening may enter the posterior chamber behind the area of iris adhesions and thus permit easy access of the ciliary processes to the trephine opening. Rapid release of aqueous, when the bulging iris is opened at the time of operation, may be one of the important factors in causing prolapse of iris processes into the trephine openings.

The same considerations apply to the Lagrange sclerectomy operation.

Iris-inclusion operations (Iridotasis, Iridencleisis). Although, like all fistulizing operations, the iris-inclusion operations depend on subconjunctival drainage, the actual outflow channels cannot usually be seen gonioscopically. The successful results of these operations are most often associated with the inclusion of a thick layer of iris tissue in one edge of the wound, rather than with a thin, atrophic layer stretched along the entire length of the incision. Probably the pressure of the two scleral lips against the thin iris layer hinders filtration, whereas if the iris is crowded into one corner, the result is a tendency toward their separation. To prevent the scleral lips from squeezing the iris between them, the use of a scleral punch forceps to remove a portion of one of the scleral lips, preferably the anterior, is advocated.

Goniotomy. Barkan's operation of goniotomy or goniotrabeculotomy[10] is advocated by him for early "trabecular glaucoma" (glaucoma simplex of the older classification), in which the angles are always open. The operation is intended by Barken to produce a direct opening into the canal of Schlemm, so that acqueous may issue directly into it. It has been shown by Duke-Elder,[11] however, that the pressure within the vessels into wnich Schlemm's canal drains is normally slightly higher than the aqueous pressure, so that fluid would tend to flow in the direction of the aqueous, were an open communication made between the two. From the viewpoint of physiology it is important also to realize that the aqueous normally enters Schlemm's canal by osmosis. The osmotic factor would be eliminated by a direct communication between the canal and the anterior chamber.

My own experience with goniotomy has indicated that the operation may be successful if the incision severs the scleral spur and allows fluid to enter the supraciliary space, as in cyclodialysis, but that, at any rate, it has only a temporary effect on the intraocular pressure. Barkan himself admitted[2] that the obliquity of the angle wall makes the operation technically difficult.

Barkan also states that goniotomy should be used in cases of congenital glaucoma. It should be of little value in those cases of congenital glaucoma, discussed by Anderson,[12] in which Schlemm's canal is absent. Incisions into the trabecula would have no effect.

For the purpose of explaining the choice of the proper operative procedures to be used in glaucoma surgery, Barkan divides both of his groups of "chronic pri-

mary glaucoma" as well as acute glaucoma into early and late stages. He suggests the use of goniotomy for the early trabecular type (the simplex group of the older classification) and an externally filtering operation or cyclodialysis for the late trabecular group. For the early narrow-angle ("chronic-congestive-glaucoma") group he prefers modified basal excision of the iris, and for the late cases, cyclodialysis. For acute glaucoma he advises iridectomy, preferring to use a keratome, which "insures that the pillars of the iris remain free of the wound" and for the late stage, cyclodialysis. I have already pointed out that goniotomy is not on a physiologically sound basis and, in my experience, is ineffectual. The use of multiple basal excisions of the iris seems entirely unnecessary in early cases of glaucoma in which the angle is narrow, which are really in the noncongestive phase of acute glaucoma; for miotics are always effective in reducing the tension to normal in these cases, preoperatively. An ordinary classical basal iridectomy, in which a keratome or a Graefe knife is used, suffices. In cases of acute glaucoma it is probably best to use a Graefe knife to avoid injury to the lens; for the chamber is always shallow, and the cornea difficult to see through. As a matter of fact, in these cases the inclusion of tags of iris in the wound is to be desired—especially in eyes that are operated on after angle adhesions have become firm—so that a filtering cicatrix may form.

The indications for using the various operative procedures for the types of glaucoma considered in the classification that I have suggested, dividing each group into noncongestive and congestive phases (chart 2), follow:

I. THE GLAUCOMA-SIMPLEX GROUP of the older classification (including chronic simple glaucoma, arteriosclerosis of the afferent vessels to Schlemm's canal, glaucoma capsulare,[13] and pigmentary-obstruction glaucoma[3]).

(a) Noncongestive phase. In this group of cases one may use either cyclodialysis or any of the fistulizing operations, depending on personal choice. Cyclodialysis is probably best in early cases, since it can be repeated without harm and is least injurious to the eye. It also lacks

CHART 2

INDICATIONS FOR THE VARIOUS OPERATIVE PROCEDURES FOR THE SURGICAL TREATMENT OF GLAUCOMA

Type of Glaucoma	Operation Indicated
Chronic simple glaucoma Arteriosclerosis of afferent vessels to Schlemm's canal Glaucoma capsulare Pigmentary obstruction Healed iridocyclitis with debris in the angle	*Noncongestive phase:* modified cyclodialysis or fistulizing operations *Congestive phase:* fistulizing operations
Shallow-angle glaucoma 1. Acute glaucoma of the ordinary type including the recurrent form formerly called "chronic congestive glaucoma" b. Acute glaucoma due to lens intumescence	*Noncongestive phase:* prophylactic; iridectomy *Congestive phase:* early, iridectomy; late, combined iridectomy—iris inclusion
Glaucoma following cataract surgery	Modified cyclodialysis
Lens dislocation	Modified cyclodialysis
Seclusio pupillae	Iridectomy
Congenital glaucoma	Iridencleisis or Iridotasis

the danger of late infection that sometimes follows the fistulizing operations.

(b) Congestive phase (occurring only in cases of long-standing or in eyes with absolute glaucoma in which vascular degenerative changes have taken place). The fistulizing operations are probably best here. There is greater tendency to hemorrhage and adhesion formation, so that cyclodialysis will probably be ineffective.

II. OBSTRUCTIVE GLAUCOMA, including shallow-angle glaucoma and glaucoma following cataract operations. The shallow-angle type itself consists of the ordinary acute form of glaucoma, including the recurrent type previously classified as "chronic congestive glaucoma" and acute glaucoma due to intumescence of the crystalline lens.

A. Shallow-angle glaucoma.

(a) Noncongestive phase. Although operation may be permanently avoided by the lifelong use of miotics to constrict the pupil, the operative procedure of choice, as a prophylactic measure, is simple basal iridectomy. This has been discussed above.

(b) Congestive phase: (1) Early cases (up to 48 hours usually). Iridectomy is advised, to open the angle, when adhesions are not too firm. (2) Late cases (over 48 hours, usually). A combination of iridectomy with partial iris inclusion, by the *ab externo* approach, is preferred.

B. Glaucoma following operations for cataract (aphakic eyes).

It has been shown[1,8] and corroborated[14] that this form of glaucoma is due to obstruction of the trabecular spaces leading to Schlemm's canal as a result of blocking by iris tissue. This condition results from delayed formation of the anterior chamber. It may be precipitated by discission, in which a mild ciliary congestion and anterior-chamber collapse may be factors, by the organization of repeated anterior-chamber hemorrhages, and by postoperative overuse of atropine. Gonioscopy may be of considerable value in distinguishing this form of glaucoma from that of glaucoma capsulare, from healed anterior uveitis, simple glaucoma in aphakic eyes, and from the condition in cases of epithelial ingrowth.

To treat this form of glaucoma surgically, only one operation is logical—cyclodialysis. It is the only safe operation for aphakic eyes, since other procedures are too frequently associated with loss of vitreous. Even trephining operations without iridectomy tend to failure in cases of aphakia because of iris prolapse. The aperture also frequently comes to lie behind the iris because of the forward position of the periphery of the iris as a result of the formation of synechiae.

The operative site for cyclodialysis in this type of glaucoma may be anywhere along the angle circumference except at the site of the iridectomy and the limbs of the coloboma. These places are avoided to prevent undue trauma and hemorrhage. The actual performance of the operation should be the same as that discussed previously under cyclodialysis.

III. OTHER FORMS OF SURGICAL GLAUCOMA. A. Lens dislocation. Cyclodialysis is the generally accepted surgical procedure. It should be performed in the upper quadrants, where no pressure is exerted by the dislocated lens.

B. Seclusio pupillae. Iridectomy is the operation of choice, to permit communication between the anterior and posterior chambers. It should be basal, if possible.

C. Healed iridocyclitis with debris in the angle. The treatment is the same as that for the noncongestive phase of the glaucoma-simplex group of the older classification.

D. Congenital glaucoma. The iridenclei-

sis and iridotasis operations, by the *ab externo* approach, are preferred, since they, of all the fistulizing operations, are least likely to lead to late infection. This is particularly important in young patients with long expectation of life. The presence of excessive iris tissue in the region of the angle makes cyclodialysis difficult.

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THE SURGICAL REMOVAL OF CORNEAL SCARS*

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The early Greek physicians, who had a remarkably clear concept of the affections of the eye and the relationship between the brain and the eye, held sight only second in importance to breathing. Diseases of the eye were classified as follows: (1) Disorders of the brain extending through the optic nerve to the eye; (2) organic disturbances in the eye, such as cataract, floating opacities, movable and fixed humors, blood, scotomata from gazing at the sun, and pterygia; and (3) those diseases due to a "solution of unity" of the eye caused by sores and wounds. Sores, if located opposite the pupil, caused blindness; if they were not opposite the pupil they caused little or no visual loss. If the sores were extensive and reached the grapelike tunica of the eye, the sore was called "the fly's head"—which is a very descriptive term for a small iris prolapse.

Much of the general medical care recommended in diseases of the eye would, even today, be acceptable; the "sparing use of food and drink, abstinence from coition, and rest of body" were advised by Hippocrates. The local medicinal treatment of corneal scars at that time is comparable to the medicinal treatments of the present day. Ointment and lotions containing cinnabar (red mercuric sulfide), gum, ammoniac, sal ammoniac, gall, honey, lead, copper, opium, salt, acacia, croton, yolk of egg, arsenic, hyoscyamus, and crocus were highly recommended and in common use. This period extended from the time of Hippocrates to 200 A.D., according to the translation of the "Syriac book of medicines" by Wallis Budge.

In early Anglo-Saxon times, the use of irritants, such as pepper, ox gall, and "tutty" (crude zinc oxide), was recommended for clearing corneal scars. In 1377, John of Arderne advised an extract of Oriental crocus mixed with egg white which "deletes maculae of the eye." A lotion of crude zinc oxide was frequently prescribed.

Chevalier Taylor, the notorious oculist of the early eighteenth century, employed two methods in treating corneal opacities. By the first method, after inserting a speculum, he proceeded to "pare off the Excrescence with a small curved knife, leaving as few Inequalities as possible, and having prevented an Inflammation by the proper Repellents, I blow a powder into the eye, which, assisted by the motion of the Eyelid, smoothes off the Inequalities left by the knife." The second method advised scrubbing of the eyeball with a small brush made of barley bristles.

Duddell, in 1729, strongly condemned Taylor for paring off corneal opacities; however, he recommended the use of the barley-bristle brush, and that the eye be scrubbed vigorously every three months. Duddell also made the observation that "the reputation of the surgeon and the loss of the patient's sight very often go together"—a comment that seems to throw some light on his experiences with "paring corneal excrescences."

In 1775, Robert Mead advised the use of a mixture of powdered glass and sugar. He stated that, "a little put in the eye every day gradually absterges and wears off the spot by its inciting quality." Mead also advocated "paring off" corneal scars. William MacKenzie, as late as 1854,

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credited him with having made the surgical removal of corneal scars an almost daily procedure.

In 1809, Erasmus Darwin made the following statement: "After ulcers of the cornea, which have been large, the inequalities and opacity of the cicatrix obscures the sight. In this case, could not a small piece of the cornea be cut out by a kind of a trephine above the size of a thick bristle or a small crow quill, and would it not heal with a transparent scar? This experiment is worth trying and might be done by a piece of hollow wire with a sharp edge, through which might be introduced a pointed steel screw—the screw to be introduced through the opaque cornea to hold it up and press it against the cutting edge of the hollow wire or cylinder. If the scar should heal without losing its transparency, many blind people might be made to see tolerably well by this slight and not painful operation. An experiment I will strongly recommend to some ingenious surgeon or oculist." This is the earliest reference to the use of a trephine for removing full-thickness corneal scars.

Scarpa, in 1809, in discussing corneal opacities, classified them as nebula, albugo (an accumulation of lymph or inflammatory infiltration), and leukoma. This investigator was the first to recommend the destruction of vessels leading to a nebulous corneal scar. He spoke of the "fasciculi of varicose and knotty" vessels, and suggested peritomy for widespread vascularization. Simple sectioning of the vessels was deemed insufficient, because it was "certain that in a few days the mouths of the vessels approach and inosculate, so as to recover their former continuity." The removal of a circumcorneal strip of conjunctiva was recommended. For leukomata, the use of ointments containing calomel, ox-gall, oil of walnuts, and butter was advised. The removal of corneal scars by cutting or scraping was condemned because of the danger of causing suppuration.

Reisinger's experiments, conducted as early as 1818, give him priority in the attempt to replace opaque cornea with clear corneal-tissue transplants.

Mackenzie advocated the surgical removal of opaque corneal tissue in cases that showed no visual improvement after the pupils were dilated with atropine. He cited nine references in the literature of the successful results achieved by other physicians following the surgical removal of opaque corneal tissue.

Donders, in 1846, made the first scientific study of the regeneration of corneal tissue. He concluded that true corneal tissue regenerates in animals, that the epithelium covering the resected area is thicker than normal epithelium, and that, when one half to two thirds of the cornea is removed, healing occurs without attendant inflammation or any other abnormality.

Wiener, in 1909, working along similar lines with rabbits, reported results confirming those of Donders. With resection of the entire corneal area, the epithelium completely covered the area in five to seven days.

Jobson, in 1909, reported the cure of a patient with nodular keratitis. He excised the nodules and removed the opaque corneal layers. Vision was improved from the ability to count fingers to 20/70. In 1912, he reported having surgically removed corneal scars and opacities in 15 cases. Two cases were reported.

In 1926, Wiener described his method of performing corneal resection and reported four additional cases. The technique consisted of making crucial corneal incisions extending to within one millimeter of the limbus. The incisions were "as deep into the cornea as possible, without penetrating through the anterior

chamber. The apex of one of the quadrants was then lifted up with a sharp iris hook (so-called dural hook) and with a sharp scalpel carefully dissected back toward the base of the triangle, great care being taken to keep in the same corneal layer as that in which we started." The technique was described as difficult. It is often impossible to judge the proper depth of the crucial incisions; scar tissue obscures the normal cleavage planes of the corneal stroma; and adherent leukoma make opening of the anterior chamber inevitable.

In 1931, Hilgartner and Hilgartner, Jr., reported 23 cases of corneal resection from the Texas School for the Blind, the Wiener technique having been used. Corneal resection was followed by radium treatment, in the effort to hold in check the formation of fibrous and vascular tissue. Most of the cases consisted of the so-called "hopelessly blind" from ophthalmia neonatorum. Improvement was secured in 20 out of the 23 cases. The best acuity obtained was 20/200. In 1937, Hilgartner reported a case of nodular dystrophy cured by corneal resection.

Verhoeff, in discussing a paper by Lloyd on lattice keratitis in 1939, stated that he had dissected off a thick corneal layer in five eyes, with relief of irritation and improvement in vision.

Zentmayer, in discussing Wiener's paper in 1909, describes the removal of a section of cornea in nodular keratitis. When subsequent healing took place the resected portion of the cornea was transparent.

The brilliant pioneer work of Elschnig, Filatov, Thomas, and Castroviejo on full-thickness keratoplasty has demonstrated that in favorable cases satisfactory visual results may be obtained in from 80 to 90 percent of the eyes. According to Castroviejo, "those eyes are favorable in which there is—(1) normal intraocular tension; (2) in which the diseased ocular tissue is confined to the cornea; (3) in which the leukoma is not very dense, although sufficient to cause considerable impairment of vision, and (4) in which there are areas of clear or slightly scarred cornea surrounding the graft."

"Unfavorable eyes include—(1) those with very dense leukomas extending over the whole or almost the whole cornea; (2) those with aphakia; (3) those with increased intraocular tension; (4) those with corneal cloudiness and densely vascularized pannus, and (5) those with anterior and posterior synechiae."

The majority of the cases which have been referred to me for keratoplasty have fallen into the unfavorable classification as outlined above, because of the extensive cicatrization, vascularity, or intraocular lesions. A method of resecting corneal tissue that would lessen the difficulties and dangers of the procedure would be desirable.

Placing the initial crucial incisions at the proper depth according to the Wiener technique is difficult because scar tissue and corneal stroma offer varying resistance to the cutting edge of the scalpel. The obliteration of the normal-lamella planes of the cornea by scar tissue and the presence of adherent leukomata increase the surgical problem as well as the natural hazards of resecting opaque corneal tissue. The following procedure has been developed in the laboratory and has given satisfaction in clinical use. It has been found to simplify corneal resection.

The method is as follows: Local or general anesthesia may be used as desired. The operative field is carefully prepared as for an intraocular operation. A speculum is inserted between the lids; and the eyeball is fixed. A small glass syringe with a sharp 27-gauge needle is filled with air. The needle is inserted into the corneal stroma, about 3 mm. from the

limbus, on a plane parallel to the iris; the bevel edge of the needle is up, and is inserted to a point 1 mm. past the bevel. The depth of the needle should reach the central third of the corneal thickness. As the pressure in the syringe is increased to about twice the atmospheric pressure—that is, the 2 c.c. volume of air is compressed to 1 c.c.—a point is reached at which the air will infiltrate the corneal stroma. A sudden sense of release is felt, and the air rapidly follows a fine linear pattern of distribution in the stroma. The air lines are threadlike in size, and crisscross one another at acute angles, overlapping to produce a white, matting effect. When the injection is continued, the same general pattern of air distribution follows until the cornea becomes quite white and its thickness is noticeably increased. One or two cubic centimeters of air is sufficient thoroughly to infiltrate the average human cornea. Occasionally, a few air-bubbles will escape into the circumcorneal subconjunctival tissue and into the anterior chamber. If the needle is inserted too superficially the epithelium may balloon out in one large area.

The site of the injection by the needle is optional. Areas of dense scarring are not infiltrated by the air, although essentially normal substantia propia anterior or posterior to the corneal opacity may be thickened by the injection. An adherent leukoma is solidly matted together and appears as a depression in the air-infiltrated cornea. The thickness of the cornea may be increased three or four times by the injected air.

The initial incision is placed near the limbus, and when the dissection reaches the air-infiltrated cornea, a feeling of crepitation is encountered and a few air-bubbles escape along the line of section. The edges of the incision spread apart at about a 15-degree angle. As soon as the deeper noninjected cornea is disclosed, the iris and the pupil become visible. When the incision has reached an adequate depth, the scar tissue is easily stripped off in the desired plane. This is performed by blunt dissection, using an iris repositor or the blunt surface of a small scissors, aided by elevation and traction of the free portion. An adherent leukoma appears as a dimplelike depression on the external surface of the injected cornea and may be avoided or extirpated. In plate 1, figures 1, 2, 3, 4, 5, and 6 illustrate the successive steps of the procedure.

The microscopic sections of the air-infiltrated cornea are of three or four times the normal thickness; the corneal lamellae are separated by the air roughly in parallel lines. The bridgelike syncytial structure of the connective-tissue cells of the substantia propria is clearly shown. Scar tissue is not readily infiltrated. Air injection alone produces no permanent gross nor microscopic corneal changes. Twenty-four hours after injection the cornea presents a normal appearance. Plate 2 shows the appearance of the air-infiltrated cornea under the microscope.

After removal of the outer three fourths of the cornea to within one millimeter of the limbus, healing occurs rapidly, with only moderate signs of inflammation.

The original findings of Donders and Wiener are confirmed: (1) Corneal tissue regenerates, and the thickness gradually approaches that of the normal cornea; (2) the epithelium rapidly covers the resected area, as a rule in from 4 to 10 days; (3) if the base of the resected area is uneven, the epithelium will cover the area, but pinpoint-sized erosions tend to form, as was shown by Rucker. For approximately three months the healed area is less thick than normally, and the surface is uneven. Gradually, however, the normal thickness is approached and the surface becomes smooth. Corneal sensation to

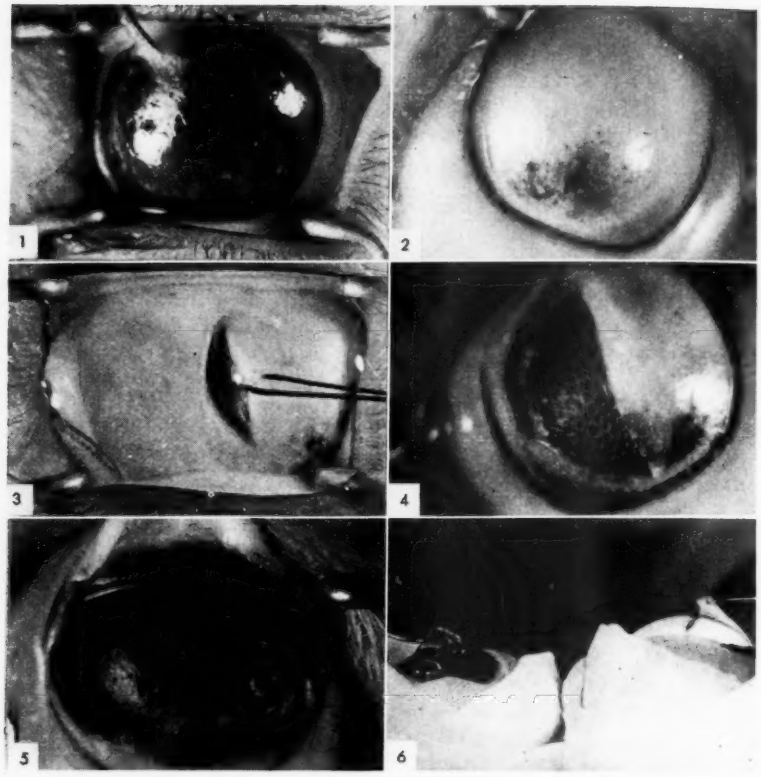

Plate 1 (James). Air infiltration of the cornea of a rabbit.

1. A no.-27 hypodermic needle is inserted into the corneal stroma and a small amount of air is injected. The linear pattern of the distribution of air is apparent between the shaft of the needle and the high light of the corneal reflex at the 8-o'clock position.

2. The corneal infiltration is almost complete.

3. The cornea is incised at the limbus, and the flap of the opaque corneal tissue is elevated and retracted. The iris is seen through the deep, clear cornea.

4. Air bubbles are seen in the anterior chamber.

5. The corneal resection is completed.

6. The increased thickness of the air-infiltrated cornea is shown in comparison with the noninjected cornea.

touch is restored in about four months.

The resection of opaque corneal tissue has been found of value in cases in which there is extensive scarring of the cornea following ulcerative keratitis, interstitial keratitis, and degenerative corneal changes, such as nodular and epithelial dystrophy. The cases should be selected carefully and the following considerations are essential: (1) The eyes must be free from active inflammation; (2) the conjunctiva should be clinically clean; (3) light perception and projection should be present, and be of a degree consistent with the eye condition present; (4) the intraocular tension should be normal.

Local anesthesia with cocaine or pontocaine instillation has been found adequate. No special instruments are required, a speculum, fixation forceps, a glass syringe, small sharp needle, a fine-toothed tissue forceps, a scalpel, an iris spatula, and a Stevens scissors constituting the equipment. Magnification of the operative

field with a binocular loupe is essential. Preoperative preparation of the eye consists of the local custom observed for ocular surgery. Postoperatively, atropine, 1 percent, is instilled and the lids are coated with White's ointment, after which only the eye that has been operated on

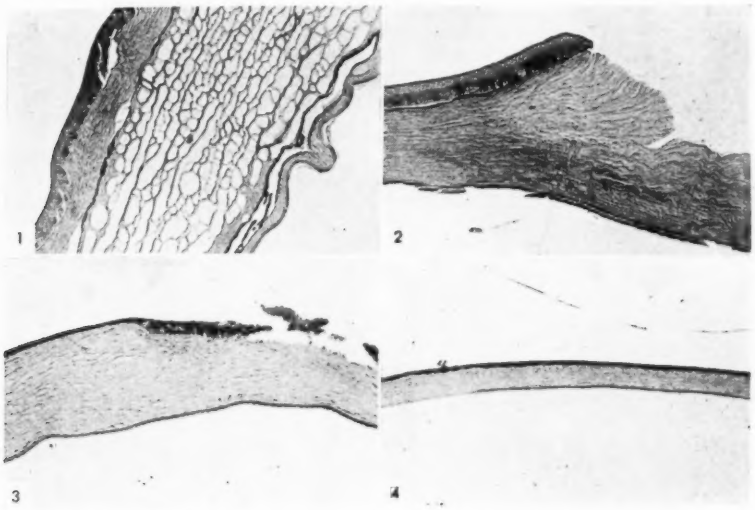

Plate 2 (James). Photomicrographs of the cornea of a rabbit.

1. The lamellar planes of the cornea are separated by the air infiltration.

2. The increase in corneal thickness is apparent at the margin of the incision. Normal cornea on the left.

3. A deep corneal resection was performed four months previously. The area of corneal regeneration has approached the normal cornea in thickness and appearance. The epithelium covering the resected area is thicker than normal and less firmly attached to the underlying substantia propria.

4. After eight months the resected area and the overlying epithelium resemble normal corneal tissue.

should be covered. The dressing is changed in 48 hours, and the patient is allowed to be up and about after 24 hours have passed. The dressing must be continued until the epithelium covers the resected area. Atropine and mild ointments, especially A and D vitamins in oil, are used if indicated. On the third postoperative day, if new corneal vessels are seen, the eye should receive a light X-ray exposure. This should be repeated on the sixth and ninth postoperative days.

Ten case reports*

Case 1. In October, 1930, L. B., a syphilitic colored male, aged 25 years, developed an ulcerative keratitis of the left eye following a superficial corneal injury. The ulcer perforated and a round, centrally placed scar, 3 mm. in diameter, remained. Viewed against the dark background of the iris, the adherent leukoma was most disfiguring. The vision of the left eye was reduced to 1/60. The right eye was normal.

On July 20, 1931, a superficial resection of the opaque corneal tissue was performed. Iris tissue was encountered, and the anterior chamber was emptied. Healing was prompt, and the patient left the hospital on July 25, 1931.

There was no improvement in the vision or in the appearance of the corneal scar. Subsequently, tattooing was advised.

Case 2. N. G., a colored female, aged 38 years, came to the Washington University Eye Clinic on January 17, 1939. She had had recurrent attacks of interstitial keratitis involving both eyes for the previous 14 years. Vision, R.E. was the ability to count fingers at 3 M; L.E. the ability to detect hand movements at 3 M. Dense corneal scars extended to within

* Cases 1, 2, 3, 4, 7, and 9 are from the Eye Clinic of the Washington University School of Medicine.

2 mm. of the limbus of each eye. The iris structure and reaction to light were apparently normal. Light projection and intraocular pressure were normal.

I am indebted to Dr. John Green for the following record of the previous care of this patient:

"*Ocular history.* February 10, 1926: Left eye sore for over a year; right for two months. Under treatment at Washington University Eye Clinic, eyes improved. Her chief complaints were photophobia, lacrimation, and poor vision.

"*Examination.* Right Eye: There were two discrete white infiltrations on the temporal side of the cornea. Pupil was well dilated. The left eye showed many old opacities bordering the limbus and three infiltrations in the center of the cornea. Vision, R.E., was 6/30; L.E., 6/12. The eyegrounds were faintly visible. It was thought that the right disc appeared a little pale; left disc normal. Wassermann was negative. The general physical examination was inconclusive. There was no evidence of pulmonary tuberculosis. Teeth and tonsils appeared to be in good condition.

"*Treatment.* She had a course of Bacillus Emulsion Mulford Tuberculin, beginning with 1:10,000 mg. and going up to 1:5,000 mg. from February to May, 1926. In June, 1926, her refraction was: R.E., +1.00 D. sph. ⊂ +1.87 D. cyl. ax. 70° = 6/6. L.E., −3.75 D. sph. ⊂ +5.50 D. cyl. ax. 80° = 6/10 partly. September, 1926: 15 minims of mercuric cyanide 1:6,000 was injected above the limbus of each eye. The patient was given a course of Old Tuberculin from October, 1926, to June, 1927. On November 10, 1927, her refraction was: R.E., +2.00 D. sph. ⊂ −2.75 D. cyl. ax. 155° = 6/40; L.E., −2.75 D. sph. ⊂ +5.50 D. cyl. ax. 55° = 6/20. I saw her again on October 9, 1934. Her vision at that time was: R.E., 6/50; L.E., 1/240. There was an invasion of the pupillary zone of whitish plaques, deposits, or infiltrations. I saw her again on January 26, 1939. She stated that it had been proposed to do an optical iridectomy on the poorer eye. I acquiesced inasmuch as the central portion of the cornea was very dense" (quotation from history furnished by Dr. Green).

The patient entered Barnes Hospital on February 20, 1939. The general physical findings were essentially normal. The blood serology was negative. A thorough resection of the opaque corneal tissue of the left eye was performed. Healing was prompt and painless. The patient was discharged on February 25, 1939. At that time the cornea of the left eye was covered with epithelium.

On May 3, 1939, vision left eye = 2/20.

The patient reëntered the Hospital on June 9, 1939. The corneal scar of the right eye was resected. She was discharged on June 13, 1939. On June 15, 1939, her vision was: R.E., 6/60, with pinhole = 6/15; L.E., 3/30, with pinhole = 6/30.

In August, 1939, a very acute nonulcerative keratitis of the right eye occurred. A complete physical examination revealed essentially normal findings. Skin tests for allergy were strongly positive for tomatoes and spinach. These foods were withdrawn, and the eye became quiet in four days. In December, 1939, after the patient had taken a tomato-juice cocktail, the right eye became red and ached for 24 hours. Since this episode the patient has followed her diet closely.

December 13, 1940: Vision, R.E., was 6/30+1, with pinhole = 6/15+1 for near vision; with +1.50 D. sph. = 10/14 (Bausch and Lomb reading card). Vision, L.E., was 3/30, with pinhole = 6/30 for near; with +1.50 D. sph. = 10/60.

January 20, 1941: Vision, R.E., was 6/20+2; L.E., 5/30.

The immediate postoperative care consisted of atropine ointment, 1 percent, and the application of an eye dressing during her stay in the Hospital. Subsequently, the patient has used adrenalin-chloride solution 1:1,000, two drops, in each eye twice daily. She has worked as a maid at the St. Louis Children's Hospital for the past two years. (Plate 3, figures 1 and 2, show the condition before operation; figures 3 and 4, the condition on January 20, 1941.)

Case 3. O. N., a colored girl, aged 14 years, entered the clinic on December 6, 1933. She presented the sequelae of ophthalmia neonatorum. Vision, R.E., was 6/60. There was a large adherent leukoma which was quite dense over the lower three fifths of the cornea. A nebulous scar covered the upper two fifths of the cornea. The intraocular pressure and light projection were normal. Vision, L.E., was equal to counting fingers at 1 M. The cornea was quite cloudy and vascularized. The eye was aphakic, and there was an operative coloboma of the iris at the 12-o'clock position. The intraocular pressure was normal.

In October, 1935, the cornea of the left eye was tattooed by Dr. Allen D. Calhoun. In December, 1935, the cornea of the right eye was tattooed. In June, 1939, vision, R.E., was 6/60; L.E., 1/60. In July, 1939, a resection of the corneal scar of the right eye was performed. The tissue was extremely tough and difficult to remove. The anterior chamber was entered at the termination of the operation. As healing progressed, the iris prolapsed. After cauterizing the tip of the prolapse with the electrocautery, this finally flattened out.

In January, 1940, an optical iridectomy at

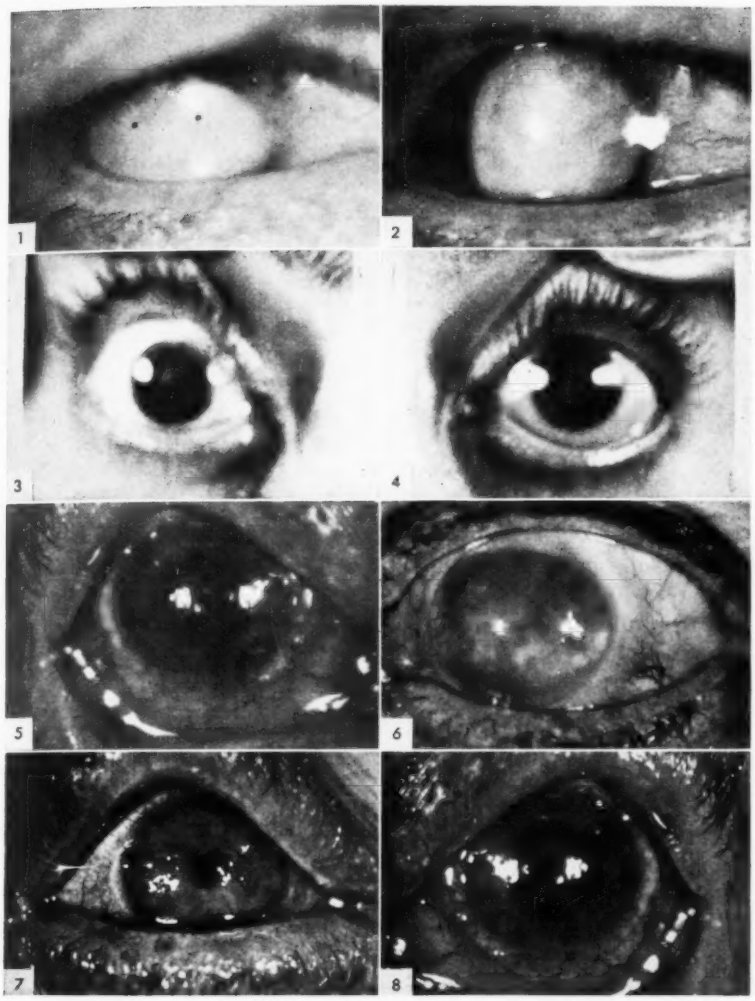

Plate 3 (James). Case 2: Corneal opacities following interstitial keratitis.

1. Right eye before operation.
2. Left eye before operation.
3. Right eye 20 months after operation.
4. Left eye 17 months after operation.

Case 4: Epithelial dystrophy.

5. Right eye before operation.
6. Left eye before operation.
7. Right eye 13 months after operation.
8. Left eye 14 months after operation.

the 10-o'clock position was done.

On May 5, 1940, vision, R.E., was 4/60; L.E., 1/60.

Case 4. H. W., a white male, aged 67 years, came to the Washington University Eye Clinic on January 17, 1939. He was overweight, alcoholic, and had moderate vascular hypertension. The blood serology was negative. Laboratory findings were normal. For the preceding three years he had suffered extreme pain because of "blisters on the eyeball." He had received treatment by three local oculists without getting relief.

Vision, R.E., was light perception and projection; L.E., the ability to count fingers at

1 M. The eyes were photophobic and painful. The corneae were cloudy, very edematous, and numerous small epithelial vesicles and erosions were present. The intraocular pressure was below normal to palpation. The case was diagnosed as a far-advanced epithelial dystrophy.

Local treatment from January, 1939, to November 6, 1939, was found to be inadequate. The ocular pain was very severe. Locally, dionine, high vitamin-A and -D oils and ointments, holocaine, neoprontosil, atropine, pontocaine, and xeroform in oil were prescribed from time to time. On June 6, 1939, a thermophore application at 140°F. for one minute was made to the cornea of the right eye. In September, 1939, the thermophore at 150°F. was applied for one minute to the cornea of the left eye. The ocular pain nevertheless continued.

On November 8, 1939, a wide resection of the anterior three fourths of the cornea of the left eye was performed by Dr. O. H. Ellis, the resident physician, for the sole purpose of relieving the ocular pain. This was successful, as the pain was relieved, and healing was uneventful. On November 21, 1939, the vision of the left eye was 6/60. On December 5, 1939, a similar procedure was carried out on the right eye. February, 1940: Vision R.E., was 2/60; L.E., 2/30.

After the corneal resection X-ray therapy was given on the third, fifth, and ninth postoperative days. Each treatment consisted of 450 R units technically reported as:

Area	Portal sq. cm.	Kilovolts	Filter 0.25 cm.	Distance	A.U.	Milliamps.	Minutes	Percent Depth Dose	Total R
Eye	27	200	1 al	50 cm.	...	15	10	28	450

The clinical course for the past year has been satisfactory. The corneae are nebulous, and there are areas of corneal edema with occasional staining with fluorescein. The patient has been free from pain. He uses Abbott's A and D vitamin in oil, two drops in each eye twice daily.

January 9, 1941: Vision, R.E., was 1/60; L.E., 1/60

Case 5. A. B., a white male, aged 48 years, was seen on March 28, 1939. For the preceding five years the eyes had been sore and painful. vision, R.E., was 6/120; L.E., 6/120. The cornea of the right eye was cloudy and heavily vascularized both superficially and deep. The corneal sensitivity was reduced. Numerous epithelial shreds were present, and there was a diffuse punctate staining of the cornea with fluorescein. The intraocular pressure was normal to palpation. There were fine deposits on the endothelium, a few cells in the aqueous, and the iris was adherent to the lens capsule along the lower two fifths of the pupillary border. The left eye was essentially the same. A tentative diagnosis of neurotrophic keratitis was made.

Local medication with a number of ointments and drugs was without appreciable results.

On August 26, 1940, the corneal opacities of the right eye were resected. The patient left the hospital on August 29, 1940. Healing was uneventful, and the vision for the right eye was 6/60. X-ray therapy was given on the third, fifth, and ninth postoperative days. The regenerated corneal tissue appeared to be healthy and firm.

On November 22, 1940, vision, R.E., was 6/60; L.E., 6/60. The cornea of the right eye was again cloudy, vascularized, and closely resembled the original preoperative state.

Case 6. R. J., a white male, aged 27 years, was injured in a dynamite explosion in a Kentucky coal mine in the fall of 1936. The right eye and adnexa were destroyed, the lids of the left eye were torn away, and the left eye was extensively lacerated. During the last half of 1938, Dr. Vilray P. Blair covered the right socket with a skin graft and reconstructed the left eyelids. The entire face was scarred and pigmented with small particles of coal.

During the summer of 1939, Dr. Lawrence T. Post saw the patient and believed that there was a bare possibility of securing some visual improvement in the left eye. At that time vision in the right eye was nil, and in the left eye consisted of light perception with questionable ability to detect hand motion; light projection was normal. The restored lids were thick and partially lined with split epithelial grafts. The conjunctival secretion was yellow, thick, and gelatinous. The cornea was opaque and vascular. The intraocular pressure was normal. All structural details of the interior of the eye were obscured. The patient was referred to me by Dr. Lawrence T. Post, and on December 15, 1939, a full-thickness corneal transplantation was done. On removing the opaque corneal tissue a dense secondary cataractous membrane was found, and a square section 4 by 4 mm. was excised. To our surprise, the grafted tissue healed rapidly, but remained nebulous for two weeks, and then vascularized very rapidly. At

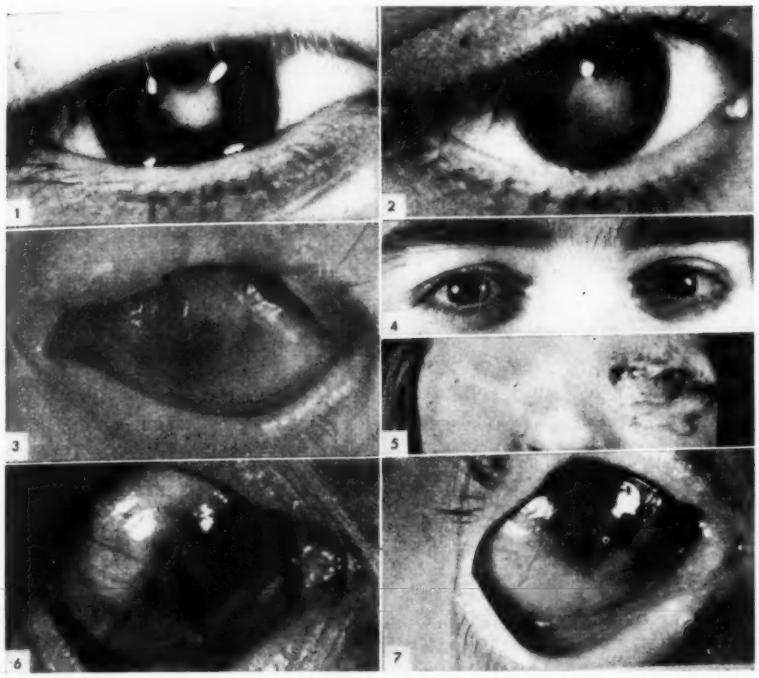

Plate 4 (James). Case 7: Central leukoma following ulcerative keratitis.

1. Right eye before operation.
2. Right eye seven months after operation.

Case 6: Traumatic loss of upper lid and complete opacity of the cornea of left eye.

3. Area of corneal resection in lower fourth of cornea is edematous and nebulous. Photograph taken two weeks after operation.

Case 9: Small central leukoma following ulcerative keratitis.

4. Photograph taken nine months after the resection of a small, centrally placed leukoma of the cornea of the right eye.

Case 8: Congenital absence of eyelids.

5. The reconstructed lids on the left eye are united by intramarginal adhesions. Opaque corneal tissue is apparent. The area of resection is nebulous and vascularized.

Case 10: Severe chemical burn of both eyes and eyelids.

6. Cornea of right eye before resection on May 3, 1940.
7. Cornea of right eye nine months after operation.

the end of 30 days the grafted area had assumed the appearance of the surrounding corneal tissue.

On March 25, 1940, the anterior two thirds of the lower half of the cornea was resected. The patient was discharged on March 29, 1940. Healing was satisfactory. The resected area remained nebulous and became vascularized.

December 8, 1940: The vision in the left eye consisted of the detection of hand movements at 4 feet.

This case, as was originally judged, was unfavorable for any type of corneal repair. (See plate 4, fig. 3.)

Case 7. W. C., a white child, aged eight years, was first seen in the Washington University Clinic on October 8, 1937. Seven years previously a gangrenous lesion of the mouth, gums, right cheek, and right orbit had developed. For over a year there was a draining sinus tract from the right orbit. The right maxilla was partly destroyed.

On October 8, 1937, vision in the right eye

was 1/60. There was some loss of bony orbital structure. The lids closed normally. The eye was divergent 30 degrees. There was a round central corneal scar 4 mm. in size. Vision, L.E., was 6/15, with a −1.00 D. cyl. ax. 170° = 6/6—. The eye was of normal appearance.

The local use of dionine, 1 percent, yellow oxide of mercury ointment, 1 percent, and massage were prescribed and employed for several months. On July 25, 1939, vision, R.E., was 1/60; L.E., with correction, 6/6—.

On July 12, 1940, the corneal opacity of the right eye was resected. The patient left the hospital on July 18, 1940. Healing was uneventful.

October 5, 1940, vision, R.E., was 6/60; L.E., 6/6— with glasses. (See plate 4, figs. 1 and 2.)

Case 8. V. G., a white child, aged four years, was referred to me by Dr. Vilray P. Blair and Dr. Lawrence T. Post. There was a congenital absence of the eyelids. A small hard mass, less than one centimeter in size, was assumed to be the abnormal right eyeball. Normal smooth skin covered the base of the right and left orbital openings. On palpation the left globe was felt to be of normal size. Light perception was present. From June, 1937, to January, 1938, several plastic operations were performed by Dr. Vilray P. Blair and his associates in an effort to restore the left eyelids and their linings. The cornea was opaque and vascular. The upper one half was covered with a split epithelial graft. (See plate 4, fig. 5.)

On July 23, 1940, the anterior two thirds of the lower one fifth of the corneal stroma was removed. The extirpated tissue was of abnormal consistency and of doughy texture. Healing with vascularization occurred.

On August 5, 1940, vision, L.E., consisted of the ability to detect hand movements at 4 feet; on November 25, 1940, vision was the same.

Case 9. S. S. S., a white male, aged 18 years, came to Washington University Eye Clinic on December 14, 1939. He was unable to secure industrial employment because of his impaired vision.

Following measles in early childhood, an ulcer of the cornea developed, leaving a superficial leukoma 3 mm. in size, overlying the pupillary zone.

Vision, R.E., was 1/60, not improved by dilating the pupil or by glasses; L.E., 6/12, with −0.50 D. sph. ⊂ −2.00 D. cyl. ax. 170° = 6/6. On April 15, 1940, the corneal opacity was resected. The patient left the hospital on April 19, 1940. Healing was uneventful.

May 20, 1940: Vision, R.E., was 6/60.

August 5, 1940: Vision, R.E., was 3/30.

January 23, 1941: Vision, R.E., was 3/30.

The patient has been able to secure employment. (See plate 4, fig. 4.)

Case 10. J. C. M., a white male, aged 49 years, consulted Dr. John Green on July 26, 1938. Three years previously, while being held up in a filling-station robbery, gasoline was thrown in his face. While blinded with pain, he wiped his face and eyes with a rag that was saturated with automobile-battery acid. A severe bilateral burn, with fusion of the lids and eyeballs, resulted.

Vision, R.E., consisted of the ability to detect hand movements at 0.5 M.; L.E., hand movements detected at 0.3 M. There was an extensive corneal scar of the right eye without evidence of penetration of the anterior chamber. The cornea of the left eye was even more densely scarred, and presented evidence of perforation.

After some preliminary dental work, the lid condition was corrected by Dr. Green.

On August 23, 1939, the first corneal dissection was performed on the left eye. A very dense, thick mass was peeled off with a good deal of difficulty. Following a corneal perforation, iris tissue was exposed. This was covered with a conjunctival flap.

On September 21, 1938, the first corneal resection was performed on the right eye, using Wiener's technique. The anterior chamber was penetrated at one point. The patient made a satisfactory recovery.

October 24, 1938: vision, R.E., was the ability to count fingers at 1.5 M.; L.E., detection of hand movements at 0.2 M. November 21, 1938: vision, R.E., was finger counting at 0.6 M.; L.E., light projection. January 23, 1939: vision, R.E., was 1/180; L.E., light projection. January 25, 1939: Optical iridectomy of the left eye "did not do a bit of good." April 11, 1939: vision, R.E., was 1/50; L.E., the detection of hand movements at 15 cm. The cornea of the right eye was cloudy and vascular.

On February 6, 1940, Dr. Green referred the patient to me for consideration of a full-thickness corneal transplantation. The condition was believed to be unfavorable, and another resection was advised. (See plate 4, fig. 6.) The vision of the right eye consisted of the detection of hand movements at 0.5 M.

On May 3, 1940, a complete removal of a thick vascular scar of the right eye, after infiltrating the cornea thoroughly with air, was performed by Dr. John Green. The posterior corneal layers adjacent to Descemet's membrane were clear. A posterior synechia at the 7-o'clock position was seen, and a bright-red fundus reflex was observed with the ophthalmoscope. (See plate 4, fig. 7.)

May 24, 1940: vision, R.E., was 1/40 with

TABLE 1

DATA ON THE RESECTION OF THE CORNEA OF TWELVE EYES

Case Number	Age yrs.	Diagnosis	Vision Before Operation R.	Vision Before Operation L.	Vision After Operation R.	Vision After Operation L.	Result	Comments
1	25	R. Normal L. Leukoma	6/6	1/60	6/6	1/60	Nil	Full-thickness corneal opacity Full-thickness corneal transplant advised
2	38	Leukomata central, 8 mm. in size	Counting fingers at .3 M.	Hand movements at .3 M.	6/30+2	5/30	Improved	Interstitial keratitis. Allergic to tomatoes and spinach
3	21	Leukomata adherent	6/60	1/60	4/60	1/60	Worse	Unfavorable for keratoplasty
4	67	Epithelial dystrophy	Light perception	Counting fingers at 1 M.	1/60	1/60	Improved	Pain relieved following resection
5	48	Neurotrophic keratitis	6/120	6/120	6/60	6/120	Improved	Vision improved. Corneal disease continues
6	27	R. Anophthalmia traumatica L. Opaque cornea. Cataract	Nil	Light perception	Nil	Hand movements at 1 M.	Improved	Unfavorable for keratoplasty
7	8	Leukoma	1/60	6/6	6/60	6/6	Improved	Full-thickness corneal transplant advised
8	7	Congenital absence of lids. Malformation of right eye. Opacity of left cornea	Nil	Light perception	Nil	Hand movements at 1 M.	Improved	Unfavorable for keratoplasty
9	18	Leukoma	1/60	6/6	6/60	6/6	Improved	Suitable for full-thickness corneal transplant
10	49	Opaque vascularized corneae	Hand movements at .5 M.	Hand movements at .5 M.	1/175	Hand movements at .5 M.	Improved	Unfavorable for full-thickness keratoplasty

Result: Improved 8
Worse 1
Nil 1
Total 10

+5.00 D. sph. There was a good recovery and no sign of infection. A week later granulation tissue developed in the resected area. The cornea stained. Lunosol ointment was used, and by July 5, 1940, the granulation tissue had disappeared.

August 16, 1940: Scar tissue reforming. Vision, R.E., the ability to see fingers at 1 foot. January 27, 1941: vision, R.E., was 1/175. Corneal scarring and vascularity are decreasing.

SUMMARY

1. The history of the surgical removal of opaque corneal tissue has been reviewed, together with the description of the operative technique developed and advocated by Wiener. The advantages, difficulties, and dangers of the procedure have been presented.

2. The preliminary infiltration of the corneal stroma with air before resecting the opaque tissue is, I believe, an original procedure. The separation of the lamellar planes of the substantia propria by the injected air makes the actual dissection much easier, and lessens the danger of accidentally entering the anterior chamber.

3. A series of 10 patients a total of 12 eyes is reported. In 10 of the 12 eyes the visual acuity was improved following corneal resection. The pain of an advanced epithelial dystrophy was relieved after removing the diseased corneal tissue.

CONCLUSIONS

The surgical removal of corneal opaci-

ties has been practiced for many years. Before the use of surgical antiseptic technique secondary infection made the procedure very hazardous. The technical difficulties of resecting opaque corneal tissue are lessened by infiltrating the corneal stroma with air before making the dissection. The air infiltration is simple and harmless.

Resection of corneal scars and vascular tissue often results in a considerable improvement in vision for patients in whom full-thickness keratoplasty is contraindicated. The results obtained in epithelial dystrophy, nodular keratitis, and neurotrophic keratitis are sufficient to warrant further trial.

The procedure is not a substitute for full-thickness keratoplasty: it may be used as a preliminary measure, or as a final attempt to secure some visual improvement in the "hopelessly blind."

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PAPILLEDEMA WITHOUT INCREASED INTRACRANIAL PRESSURE*

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Swelling of the optic nerve is neither rare nor difficult to diagnose, but as yet no all-inclusive etiologic theory has been propounded that satisfactorily explains the variety of its manifestations. Papilledema is most often associated with increased intracranial pressure or intra-orbital-vein compression. Many cases, however, occur without either of these being present.

The six cases recorded here include four patients in whom the nerve involvement was unilateral and two in whom both eyes were affected. Tenderness of the eyeball and pain on movement of the globe were present in varying degrees in all the cases as was also early visual disturbance, ranging from a slight blur to total blindness. In one patient the condition might have been attributed to an orbital cause, but in the others nothing was found to account for the eye changes.

There were so many possibilities in each case that our interest was aroused and our curiosity stimulated, so that investigations were undertaken, but even with these incentives and exhaustive studies the etiology of this disorder was not determined. The changes in the disc, the unpredictable course, the response to treatment or the complete failure of medication, all added zest to the endless search for truth and increased the urge to overcome the difficulties that made solution of the problem seem impossible. Appreciating the fact that these cases are not unique, for we have had other cases, they are presented as a clinical photographic contribution to elicit a discussion regarding diagnosis.

Case 1 (fig. 1). For three weeks a 38-year-old male had noticed that the sight of his left eye was failing. He had slight ocular pain. The discomfort was almost inconsequential, and its presence was admitted only after close questioning. He seemed to be in excellent health, although he was subject to colds which were followed by asthma. He displayed no other symptoms of allergy, and had never had any nasal treatments. His past medical history disclosed nothing of note.

The vision of the right eye was 20/15 and type 1. The pupil was 3 mm., regular, and active. The media were clear, and the disc was distinctly outlined. The fundus was normal.

The vision of the left eye was 20/30, with correction 20/20, type 1. The pupil was 3 mm., regular, and active. The cornea, aqueous, and lens were clear, but in the vitreous there were fine dustlike opacities. The retina was edematous. The disc projected about 1½ diopters, and was almost as red as the remainder of the fundus, with which it merged. Over the disc the dilated, but not tortuous, veins were traced. The arteries were smaller than normal, and could be followed only by carefully focusing on the different retinal levels. There were no hemorrhages nor exudates. The visual field was slightly contracted.

Report of the X-ray examination was as follows: "In the vault of the skull the bone structure is normal and there is normal distribution of diploic and vascular markings. In the base of the skull the outstanding finding is a bilateral flattening of the anterior clinoid processes and absorption of their tips to needle-like points. The absorption is more prominent in the left clinoid process than in the right. This finding is strongly indicative of a suprasellar mass. There are no intracranial calcifications. All the sinuses and the mastoid processes are normal. The optic foramina are equal in size and are cleanly outlined."

Three days later the swelling of both the disc and the retina had increased, and there were several prominent wrinkles near the temporal side of the disc. Because of the progressing edema and the radiographic findings, serious thought was given to a diagnosis of intracranial disease.

Five days later the retinal edema was less marked, but the disc was paler and more swollen, and a thin cloud, like mist on a mountain, was present over its lower edge; this partially obscured the border. There were several thin striate hemorrhages contiguous to the

* Read before the American Ophthalmological Society, at Hot Springs, Virginia, May 29-31, 1941.

nasal side of the disc. The inferior temporal artery dipped into the retina and appeared irregular in caliber, but otherwise the arteries were much clearer. The veins were less distended. At this time the patient's physician made another complete examination and reported that he could find no abnormalities, and that neurologic tests were negative. All sensory transmissions were intact. Motor reactions were normal, the gait was normal, and the Romberg and Babinski tests were negative. His dentist found no disease of the teeth.

Blood examination: Hemoglobin, 94 percent; white blood cells, 6,400; red blood cells, 4,820,000; polymorphonuclears, 62 percent; lymphocytes, 37 percent; myelocytes, 1 percent.

edges of the swollen disc sloped to the retinal level of the nerve head, which was readily demarcated from the remainder of the fundus by its light-pink color. The vessels on the disc were heavily sheathed with a white exudate; the veins were distended, but not tortuous, and the arteries were less readily defined than the veins, especially in the lower half of the fundus. There was a bright, curved vitreous reflex over the lower nasal portion of the disc.

The blind spot was about three times its normal size.

Vision, left eye, was 20/20. The pupil was 3 mm., regular, and active; the media were clear, and the disc was sharply outlined with negative vessels.

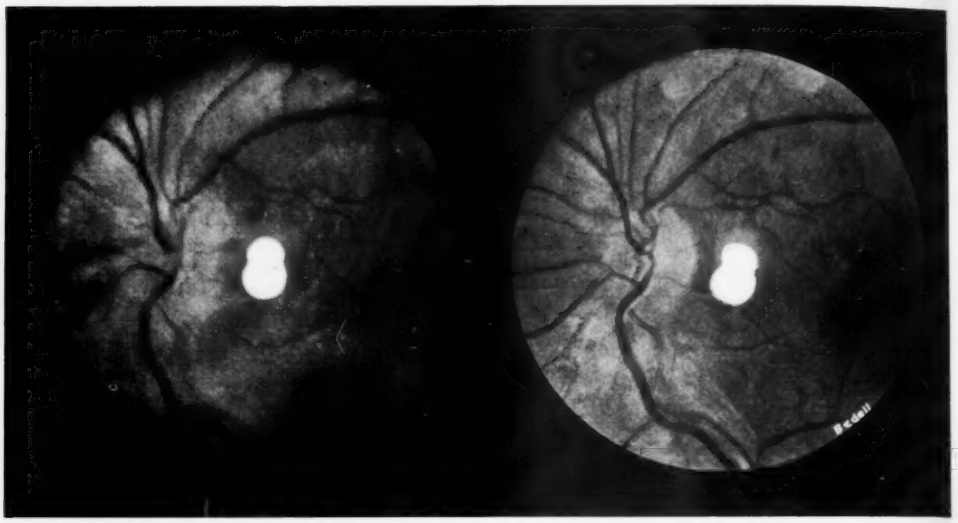

Fig. 1 (Bedell). Case 1. Left: edematous nerve head; full veins; narrow arteries. Right: the same eye one month later. The disc is flat, clearly outlined.

Urinalysis negative. Wassermann negative to all reagents.

One month after my first examination, the vision of the left eye was 20/15. The disc was flat, clearly outlined, and of normal color. The retinal vessels were also negative. Up to the present, three years later, there has been no recurrence.

Case 2 (figs. 2 and 3). A month before examination, a 28-year-old butcher noticed that his right eye was bloodshot. He covered his left eye and discovered that colors were not seen clearly with his right eye. He had a dull frontal headache, but no actual pain.

Vision, right eye, was 20/30; with correction, 20/20, type 1. The pupil was 3 mm., regular, and active. The media were clear. The

The patient's complete physical and neurologic examinations were negative. Blood examination: Red blood cells, 5,720,000; hemoglobin, 114 percent; color index, 1.00; white blood cells, 9,850; differential count: polymorphonuclears, 48 percent; eosinophiles, 1 percent; basophiles, 1 percent; large lymphocytes, 30 percent; small lymphocytes, 16 percent; neutrophilic myelocytes, 1 percent; metamyelocytes, 3 percent. Urinalysis was completely negative.

The X-ray examination showed normal bone structure throughout the calvarium, with normal vascular and diploic markings. The sella turcica was normal in structure, and the pituitary fossa was also normal. Immediately above the dorsum sellae, and extending back for a very short distance, were two linear markings,

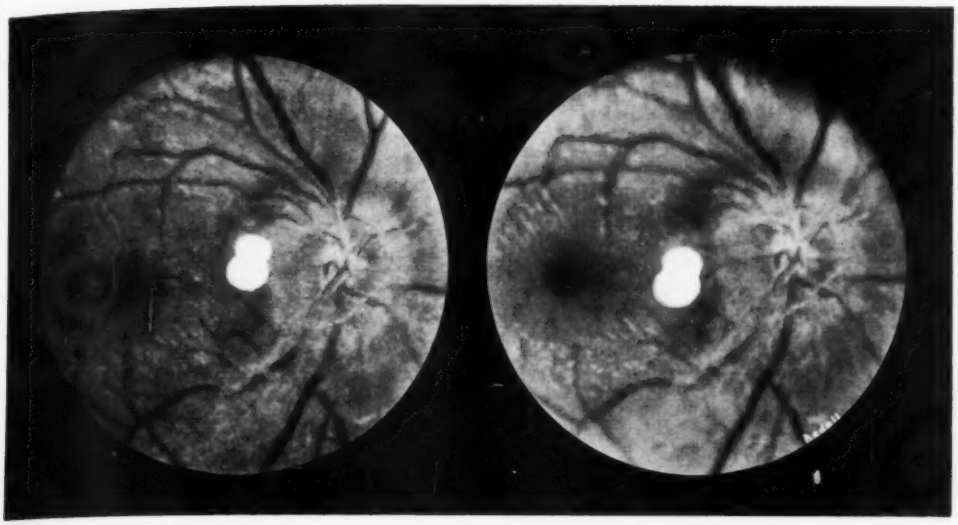

Fig. 2 (Bedell). Case 2. Stereoscopic view, showing an edematous disc; central vessels sheathed; an oblique line of vitreous reflex.

evidently the shadows of the free margins of the tentorium cerebelli.

The accessory nasal sinuses were relatively large. The left frontal cells contained several transverse septa in addition to the usual longitudinal ones. The most lateral cells on the left side were more opaque than any of the other frontal cells, but a study of the film proved that this too was due to very broad anterior terminations of the several horizontal septa. The ethmoid cells on the right side did not contain fluid. The antra and the sphenoid sinuses were clear.

Three weeks later the vision was 20/20. The vitreous reflex had disappeared, but the disc was covered with a definite, translucent edema through which, on a deeper level, the enlarged disc was clearly seen.

The patient's improvement was steady. The disc became flat, returned to its normal size, and the border was clearly defined. The vessels on the disc were less sheathed, and they, like

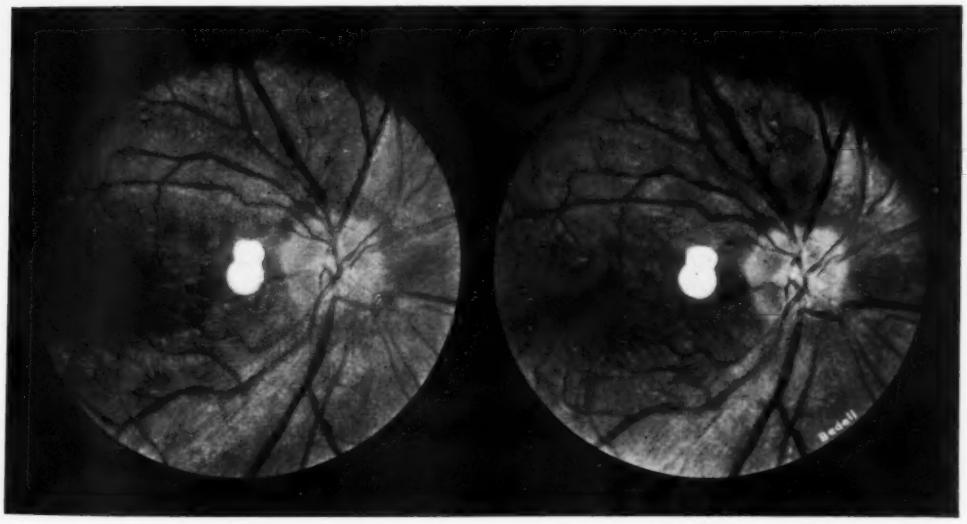

Fig. 3 (Bedell). Case 2. Stereoscopic view, taken three weeks later. The disc is flat and sharply outlined.

the retinal vessels, were otherwise negative. The treatment consisted of the administration of mercury, iodides, and atropine.

The eye has remained quiet for the last year. After a painstaking search no etiologic excitant was discovered.

Case 3 (fig. 4). An 18-year-old male was first seen September 28, 1929, at which time he gave a history of diplopia, with pain in his left eye, which had started two weeks previously. He complained of dizziness, and had a slight weakness in his legs, so that his gait was uncertain. His physician said that there was ocular-muscle weakness, with slight paresis of the right side of his face, loss of abdominal reflexes, and numbness with tingling sensation in the fingers of the right hand.

The patient further stated that the sight of the right eye failed five days before he came for examination, and that moving his eye gave rise to pain.

Vision, right eye, was 1/200. The pupil was 4 mm., regular, and active. The media were clear; the entire fundus was gray. The disc projected several diopters, and the superior temporal portion was the most prominent, and the nasal side the least swollen. The retinal veins were normal in size and distribution, and could be traced through the edematous nerve head into the central excavation. The arteries were on a deeper level in the disc, and were correspondingly a little more veiled and a trifle smaller than normal.

There was a large central scotoma, and the blind spot was enlarged.

The left eye was negative, and remained so during the entire two years the patient was under observation. Vision, left eye, was 20/20. The pupil was 4 mm., regular, and active; the media were clear. The disc was clearly outlined, and the fundus was negative.

The patient was admitted to St. Peter's Hospital. Urinalysis was negative and the Wassermann test was also negative. The X-ray examination of his head disclosed no pathologic changes.

Spinal-fluid Wassermann test was negative. Colloidal gold test 0012210000. No increase in sugar; slight trace of globulin. The spinal fluid was negative for tubercle bacilli. Blood sugar, 100. Blood examination: hemoglobin, 100 percent; red blood cells, 4,744,000; white blood cells, 6,600; polymorphonuclears, 70 percent; small monocytes, 21 percent; large monocytes, 5 percent; eosinophiles, 4 percent.

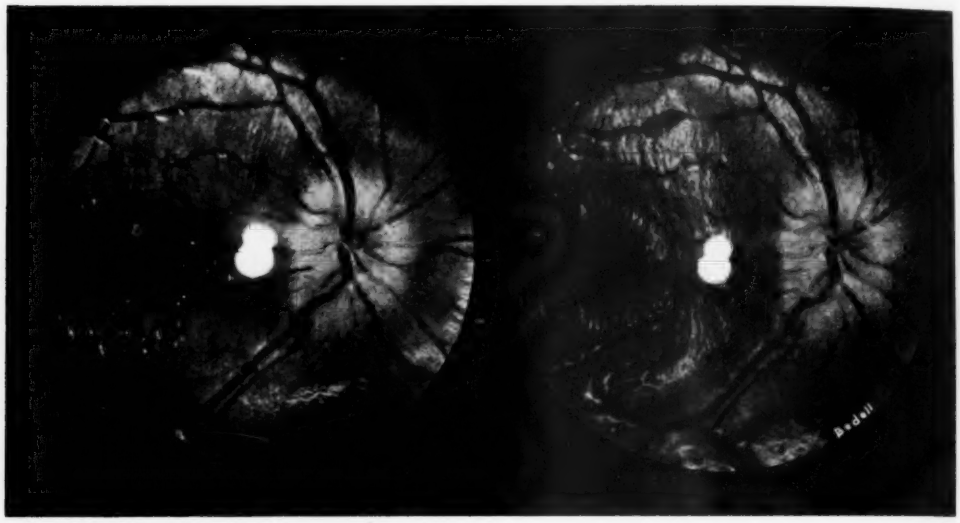

Fig. 4 (Bedell). Case 3. Stereoscopic view, showing marked disc edema with deep central excavation.

There was no nystagmus nor facial weakness, and, with the exception of the absent radial and biceps reflexes, his neurologic examination was negative. Nasal examination was negative.

The disc swelling decreased so rapidly that 18 days later the edge was clearly seen. However, the vision was only 2/200, and the diminution in the size of the central scotoma and the blind spot was negligible.

Gradually the disc became flat, and the central scotoma was reduced to less than 1 degree, but the blind spot remained large.

When last seen, two years after his first visit, the vision was 20/70. The disc was white, with a well-defined border and without any overlying veiling.

This was another unilateral papilledema. The most striking feature was the great swelling of the temporal portion of the disc. There has been no recrudescence.

Case 4 (figs. 5 and 6). When a 13-year-old boy awoke one morning, he found that he could not see out of his right eye. The history was completely negative. He had had no illness of any kind, had not complained of pain nor of anything referable to head or eyes. A complete physical examination was negative, as were all the laboratory tests, including the Wassermann.

The vision of the right eye was 5/200. The pupil was 3.5 mm., regular, and active. The media were clear. The retinal veins were about three times as large as the slightly narrowed arteries. The dominant fundus feature was the three full, not tortuous, veins as they converged on the disc and disappeared in the well-maintained central excavation of the edematous nerve head, which had a fine vascular crown. The swelling extended beyond the disc. Several striate hemorrhages ran parallel to the superior vessels.

Within 11 days the picture had changed. The swollen disc was much paler and more prominent, with several recent hemorrhages on an exudate cap. The upper retinal veins approached normal size more nearly than the inferior veins of the retina, especially the temporal branch, which remained large. Eight months later the disc was almost completely covered by a translucent exudate; the veins were less distended. After five months the disc was clearly outlined, and the vessels were normal in size, but a connective-tissue film, roughly triangular in shape, covered the central portion of the disc, the base of the triangle overhanging the upper disc border. The vision was 20/20, and there were no field defects.

The left eye was always free from trouble. The pupil was 3 mm., regular, and active. The media were clear. The disc was flat, and the fundus was negative.

The patient had no further annoyance for three years, and then, for some unknown reason, he developed a frontal headache, with hypertension, 150/110, but no demonstrable kidney involvement. When his refractive error was corrected, his headache disappeared.

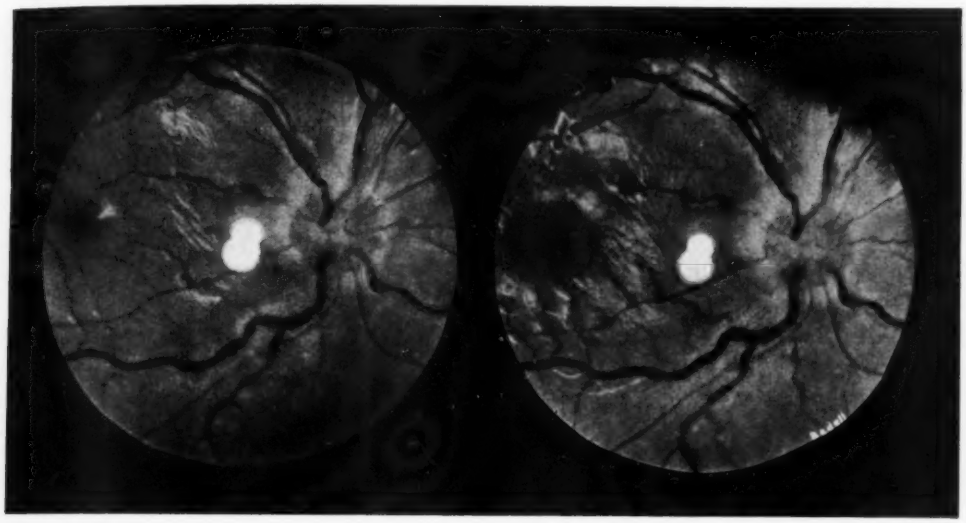

Fig. 5 (Bedell). Case 4. Stereoscopic view, showing edema of the disc; large veins; small arteries; and retained central excavation.

In 1934 he had a transitory blurring of vision, with some macular edema which disappeared in a few days.

Three days later, February 26, 1937, he suffered an attack in which the vision was reduced for two days and his eyes were painful on motion. At that time he had a slight coryza. The vision was 20/20, and externally the eye was negative, but the fundus presented a marked change. The disc was so swollen and gray that the margins were not visible. The veins, particularly the inferior ones, were again distended, and several long, thick-streak hemorrhages were present on the temporal side of the disc and beneath the triangular cap of exudate, which was not only larger, but much denser than it had ever been before.

In a few days the hemorrhages were absorbed, but there was a thick, glistening, dotted vitreous veil overlying the disc.

An inspection of the fundus on May 14,

1937, showed that the disc veil was almost the same as it was before the flare-up.

When last seen on June 28, 1939, the vision was 20/20. The fundus was mottled, the disc slightly pale, but the veil was not only transparent but also much smaller.

This was a case of unilateral papilledema with a connective-tissue remnant which increased in size and thickness during a recurrence of the edema, and then disappeared almost entirely.

No cause for the condition was discovered. The teeth, the tonsils, the sinuses, and every other organ were without pathologic evidences and, with the exception of the evanescent hypertension, no circulatory symptoms were ever present.

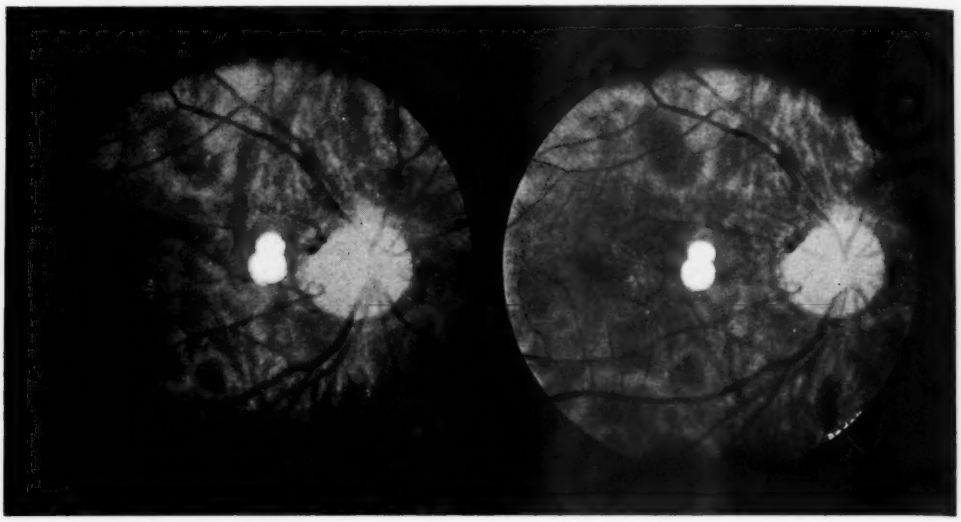

Fig. 6 (Bedell). Case 4. Stereoscopic view, showing the same eyes after disappearance of the edema. Pale well-outlined disc with delicate veil over the upper portion; a few scars in the macular region.

Case 5. Sudden, bilateral blindness is not uncommon, but when papilledema is the outstanding fundus change, an emergency exists that calls for prompt, intelligent investigation.

A 43-year-old male was seen first when his vision was reduced to light perception in each eye. He had never had any difficulty with his sight until September 5, 1935, when both his eyes were sore; that is, tender to the touch and on motion.

Four days later, the vision of the right eye was hazy. A week later the patient complained of nausea, and, because he had a toothache, he went to a dentist who advised immediate extraction of several abscessed teeth. Four teeth were removed from the upper jaw under novocaine anesthesia. That night he had pain in the left eye, and the vision began to fail. The following day two more teeth were extracted and his vision became much worse in each eye, although he was able to drive his car to the dentist's office.

On September 18, 1935, vision in the right eye consisted of light perception. The pupil was 6 mm., and there was no reaction to light or accommodation. The media were clear. The disc was edematous, with rounded edges, and the retinal veins were so much fuller than normal that they appeared like large, dark-red bands. No hemorrhages nor exudates were present.

Vision, left eye, consisted of light perception. The pupil was 6 mm., stationary. The media were clear. The disc was swollen and gray, and the margins undefined. The retinal arteries were small, and the straight veins were greatly dilated. There was practically no visual field in the left eye, but in the right eye a small nasal arc was outlined with a 4-degree target.

The patient entered St. Peter's Hospital. The X-ray report was as follows: "No abnormalities are seen in the bony structure of the skull. The pituitary fossa is normal for size, and the sella turcica is entirely normal in structure. The sphenoid sinus is normal. All ethmoid cells and the antra are clear. There is calcification in the anterior part of the falx cerebri."

Laboratory tests: The spinal fluid was clear, and there were eight cells per cubic millimeter. There was no demonstrable decrease in the sugar content, the Wassermann test was negative, and the colloidal gold test 000,000,000.

Blood examination: hemoglobin, 68 percent; red blood cells, 3,512,000; white blood cells, 9,600; polymorphonuclears, 72 percent; small lymphocytes, 24 percent; eosinophiles, 4 percent. The Wassermann test was negative to all antigens.

The blood nonprotein nitrogen was 38.2; urea, 15.7; uric acid, 3.7, chlorides, 399; blood sugar, 72 mg.

The urine was negative; specific gravity 1,016; no albumin, sugar, nor pathologic elements were present.

The patient had had whooping cough, scarlet fever, measles, and chicken-pox as a child, but during adult life the only pathologic condition was so severe that vision was permanently impaired. At no time were there any signs of inflammation, such as the presence of exudates or hemorrhage.

Case 6 (figs. 7, 8, 9, and 10). This last case is reported because it varied clinically from the other cases described. A lady, aged 20 years, had had an attack of red eyes accompanied with poor vision before she came under my observation. Four years ago she was in a hospital for three weeks because her "right eye was paralyzed." Three weeks preceding her first visit to me she had a "cold" with bronchitis, which was followed by severe pain, first in one eye and then the other, and at times an intense

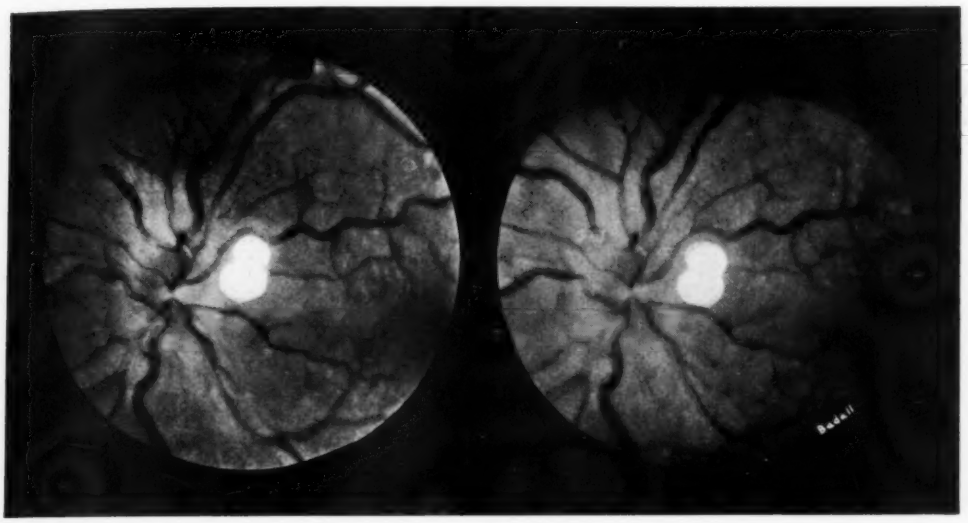

Fig. 7 (Bedell). Case 6. Stereoscopic view, taken October 2, 1937. The upper half of the disc is most edematous. Full veins and a small, shallow, central depression.

had been a left-sided chronic suppurative otitis media. The family history was negative. The blood pressure was 140/66. A complete physical examination was negative.

Two weeks after the first examination the right disc was pale and flat, with clear outlines. The retinal veins were of normal size, but the arteries, especially on the disc, were narrowed. The left nerve head was white, and the edges were a little fuzzy; the arteries were very narrow, and the veins were not abnormal.

When last seen, on September 6, 1940, the vision of the right eye was 10/200. The disc was pallid and the arteries were narrow. There was an inferior hemianopia with a central scotoma. The vision of the left eye consisted of light perception. The disc was white and the retinal arteries were small.

In this case both nerves were involved, and there was a rapidly developing edema which face-ache. There was no history of any constitutional disorder.

On October 2, 1937, vision in the right eye was 4/200. The eyeball was proptosed several millimeters. There was extreme limitation of motion in all directions. The globe was greatly congested, with marked distension of several large conjunctival veins and edema of the palpebral conjunctiva. The pupil was 3 mm., regular, but reacted sluggishly to light. The media were clear. The disc was edematous, swollen about 6 diopters, and there was marked dilatation of the veins but little increase in the diameter of the arteries. There were no hemorrhages nor exudates.

Vision in the left eye was 20/20, with almost the same conjunctival congestion, globe proptosis, and immobility seen in the right eye. The pupil was 3 mm., and the media were clear. The papilledema was marked, 6 diopters with

a small central excavation. The veins were greatly distended, but there was neither exudate nor hemorrhages. The patient was admitted to St. Peter's Hospital.

On October 4, 1937, the X-ray report was that, "All bone structure in the vault of the skull is normal. The vascular grooves are normal, and there is nothing unusual about the diploic markings. There are no intracranial calcifications. The sella turcica is normal for size and outline; all of the processes are well demonstrated and are negative for erosion.

"The anteroposterior stereograms of the skull show nothing that is in any way suggestive of intracranial pathology. None of the sinuses show evidence of acute or chronic disease. The teeth show no evidence of abscess."

The Wassermann reaction to all antigens was negative.

The spinal fluid was clear, no cells were present; there was no decrease in sugar; globulin was negative; and there were no organisms on smear or in culture. The urine at times showed a trace of albumin and a few granular casts.

Blood examination: hemoglobin, 70 percent; red blood cells, 4,312,000; white blood cells, 8,200; polymorphonuclears, 78 percent; small lymphocytes, 18 percent; large lymphocytes, 1 percent; eosinophiles, 3 percent.

On admission the patient complained of intense pain in the frontal region, which was so severe that she said she did not attempt to move her eyeballs, because this induced nausea. Her general physical examination was completely negative.

On spinal puncture, the fluid was found to be clear, with a questionable increase in pressure. There was no evidence of block in the Queckenstedt test.

When the patient was discharged from the Hospital on October 25th, there was marked proptosis of the right globe, with almost complete loss of motion. The eyelids were red and swollen, with severe ciliary congestion. The disc was greatly swollen, and the retinal vessels were tortuous and distended. There were no hemorrhages nor exudates.

The left globe was more prominent than the right. The bulbar congestion and the papilledema were extreme, with several hemorrhages on the sides of the disc.

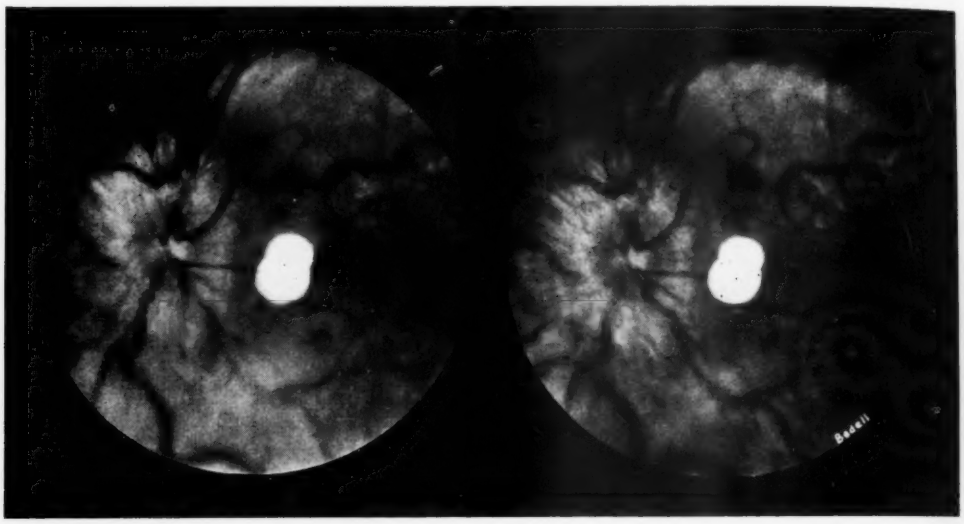

Fig. 8 (Bedell). Case 6. Stereoscopic view, taken November 5, 1937. The disc is more uniformly swollen with a cap of fine vessels.

Her condition was so alarming that she was sent to Dr. Gilbert Horrax, in Boston, who reported as follows: "Normal sensation in the face, and no facial weakness. Hearing was intact, and all the other cranial nerves were negative. No sensory or motor disparities of the upper or lower extremities existed. The ventriculogram showed that the ventricular system was entirely within the normal limits. Ventricular fluid was normal. Blood studies: blood sugar, 60 mg.; nonprotein nitrogen, 29 mg.; sodium chloride, 586; white blood cells, 8,550; red blood cells, 4,300,000; hemoglobin, 70 percent. Differential blood count: polymorphonuclears, 66 percent; lymphocytes, 24 percent; large monocytes, 9 percent; eosinophiles, 1 percent. Urinalysis: specific gravity, 1,016; acid reaction; very slight trace of albumin; negative for sugar or acetone; an occasional red blood cell; from 4 to 6 white blood cells per high-powered field."

On her return from Boston, four days later,

the patient showed marked improvement. The orbital edema was much reduced. The right disc, although swollen, with pale rounded edges, did not mushroom as far as previously. The veins were smaller, and there was a very delicate macular star. The disc was so greatly swollen that it was paler than it had been at the height of the disease.

By November 30, 1937, there had been progressive improvement; the disc became paler, and was elevated about 3 diopters as compared with 6 diopters in October. The vessels were well outlined and almost normal in size.

The fundus of the left eye was more severely congested than the right. The pink disc outlined, and of normal color. The retinal vessels were negative. The eyeball was white and freely movable in all directions.

The left eyelids were swollen, and a narrow palpebral fissure was present. The eyeball was only 0.5 mm. more prominent than the right, but was intensely congested, with large conjunctival veins. The vision was 20/20. The pupil was 4 mm., regular, and active. The fundus was peculiar in that the pale pink, well-defined disc formed the border of a large, irregularly oval retinal elevation that extended to the macula, but did not go beyond it. Through the translucent retina, bright subretinal reflexes were noted. These, combined

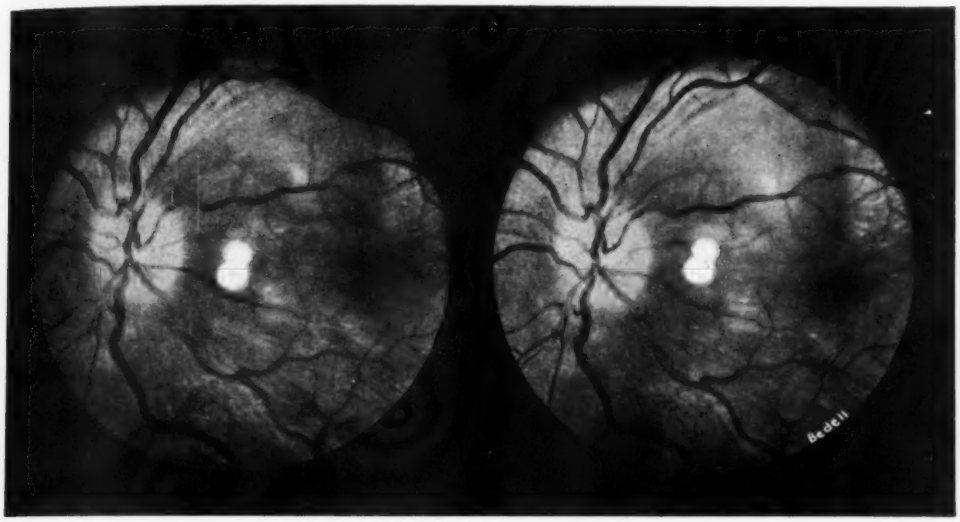

Fig. 9 (Bedell). Case 6. Stereoscopic view, taken December 12, 1939. The disc is flat and clearly outlined. The retinal veins are much less distended; there is marked retinal edema between the disc and the macula.

was elevated 3 diopters, and the retinal vessels were dilated, but were only half their former size.

Three weeks later the mottled background of the fundus became visible for the first time; the dic was flat, pink, and sharply outlined, with many vessel branches on its surface.

The fundus of the left eye was hazy—the cloudiness of edema—the disc was flat, and the vessels normal.

The patient was seen again one year later, when a follicular conjunctivitis was present. The fundi were negative then, except for a few fine, bright dots in the macular region.

Another year passed uneventfully, but on December 12, 1939, she reported that her left eye had been painful for six days and that the vision had been blurred for three days. The vision of the right eye was 20/20. The pupil was 3.5 mm., regular, and active. The media were clear; the disc was clearly and sharply with the remarkably brilliant red of both the arteries and the veins, lent an unreal, almost artificial appearance to the entire fundus. There was an absolute scotoma corresponding to the retinal lesion.

The patient was three months pregnant.

Five days later the entire retina of the left eye was edematous, with radiating wrinkles at the macula. The disc was elevated, and the vessels were distended.

The right eye remained clear.

On December 28, 1939, vision in the left eye was 20/50. The papilledema was 3 diopters, and the vessels curved over its prominent edges. The great retinal swelling made all fundus details indistinct. There was a very fine granular partial macular star.

The patient was last seen on January 6, 1940, three weeks after the recrudescence, at which time the bulbar congestion had disappeared. The disc was flat, and the vision 20/30.

She was delivered at term of a healthy baby, and for 13 months, according to her letter, has been free from any ocular annoyance.

That this very alarming train of signs and symptoms was not caused by an intracranial tumor was conclusively proved by the course the disease ran subsequent to the ventriculography. That the condition was not the result of active sinus disease was proved by the absence of any visible nasal pathologic findings and by the negative X-ray films.

It may be that there was some compression of the central retinal vein in the orbit, but, even if this were so, the etiology is nevertheless, a mystery. So far as is known she was not allergic, and there was no marked recession after the administration of adrenalin. It is to be noted especially that she has had three attacks. The second one was the most severe, yet it subsided with complete physical and functional recovery. The third attack was unilateral and extreme, but of short duration.

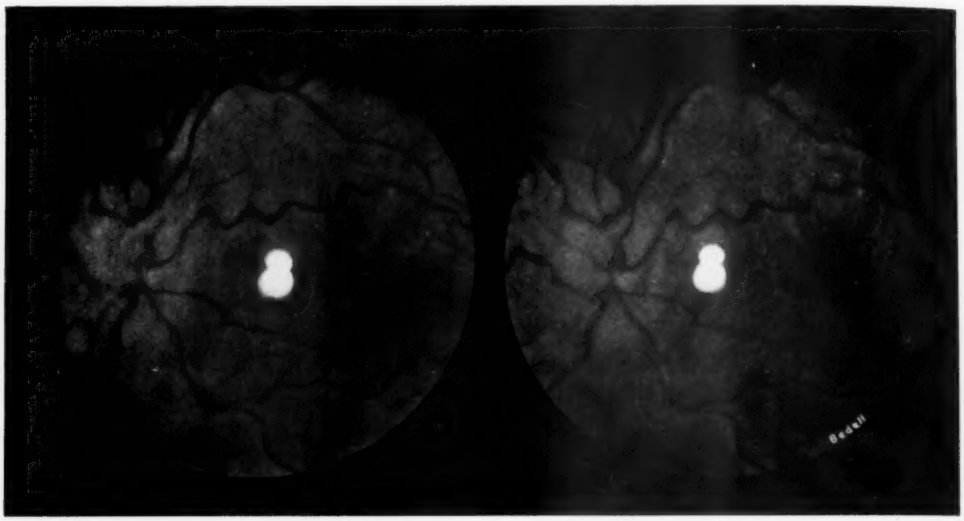

Fig. 10 (Bedell). Case 6. Stereoscopic view, taken December 28, 1939. Shows an acute recurrence: the disc is elevated 3 diopters, with a clear, curved temporal margin. A fan of macular exudate.

These cases are presented to prove the value of colored stereoscopic fundus photographs when used to differentiate an inflammation of the optic nerve, a papillitis, from an edema—papilledema. Such a differential diagnosis is made with difficulty for at least two reasons: first, because clinicians and authors confuse the terms by employing the names neuritis and choked disc interchangeably, without considering the structural alterations that take place in the nerve. The second reason is the frequent similarity presented by the ophthalmoscopic picture. Years ago the statement was made that the degree of disc elevation was the essential difference, but every careful observer must admit that this theory is fallacious.

The literature on papilledema is voluminous and the published conclusions are contradictory. What appears to be an optic neuritis to one physician may be called papilledema by another, and a frank neuritis is not infrequently referred to as a retrobulbar neuritis.

One of the most illuminating, exhaustive, and well-authenticated résumés on papilledema without intracranial pressure was presented by Dandy. In his second report he recorded his experiences with 44 cases, 42 of which were bilateral and 2 unilateral. In only one case did the papilledema recur. Dandy stated that the condition seemed to involve no danger

to life, that no operation was indicated, and, so far as he knew, no treatment was of benefit.

When attempting to explain these cases, the demyelinating diseases—disseminated sclerosis, acute disseminated encephalomyelitis, neuromyelitis optica, and encephalitis periaxialis diffusa—were constantly kept in mind, and it was impossible completely to exclude disseminated sclerosis.

Berliner's review in 1935, a comprehensive, well-sustained dissertation, brought the literature up to date.

Unfortunately, we cannot enter into a full discussion here of papillitis or papilledema, so that the cases must be judged on the photographic evidence which, of course, must be used in conjunction with the clinical histories.

A careful analytical study of this report supplies material for prolonged discussion, although the examination of the photographs seems to leave but little doubt that the process was basically an edema.

In case 1 there was a swelling of the nerve head, with a small amount of exudate and a few hemorrhages.

In case 2, the nerve on the level with the retina was pink and partially obscured by a considerable overlying edema, whereas in case 3, there was a marked edema of the disc with preservation of the large central excavation, but at no time were there hemorrhages or exudates.

Case 4 showed primarily a very great dilatation of the retinal veins, and later an infiltration with organization of exudate.

The dilatation of the retinal veins was somewhat similar to that in case 5, but the involvement was bilateral and partial optic atrophy resulted.

In the last case the papilledema was bilateral and characteristic. Later there was a recurrence in one eye, with the identical type of swelling.

Whenever the optic nerve is involved, the ophthalmoscopic report should be based on the knowledge of the anatomic structures of the fundus, and careful attention should be given to the normal, thick nasal half of the disc as well as to the flatter temporal portion.

Papilledema is generally unaccompanied by marked visual change until it has been present for a considerable time. The cases, here reported, show that, under unusual conditions, a severe compression of the nerve fibers may lead to the initial symptom of early visual loss. Ordinarily, restoration of function is prompt, but if the strangulation of the nerve is protracted, secondary atrophy may result.

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DIFFERENTIAL DIAGNOSIS OF THE TROPIAS*

WITH PARTICULAR REFERENCE TO THE VALUE OF ORTHOPTIC TRAINING

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It is essential that we properly diagnose the kind of squint with which we are dealing before we attempt the treatment. We must not accept the diagnosis of "squint." Such a designation is not a diagnosis. Is the squint a functional disturbance only? Is it mechanical, and if so has it a functional factor or any other complication? For example, is there a vertical deviation, and if so has it an etiologic bearing on the squint? Perhaps, on the contrary, the vertical deviation is the *result* of the convergent squint, in which case the treatment is entirely different. When a case comes to our clinic a definite routine of study is made in all instances and a definite diagnosis arrived at. We may then, and *only* then, outline the treatment to the parents and to the orthoptic department. In general the following outline is followed:

1. History. Family and case histories are important. Was the birth of the child normal? Were forceps used? Was there complete anesthesia of the mother? Was there suspended respiration of the infant? What was the age of onset of the squint? Was there an antecedent illness or injury?

2. Fundus examination and refraction.

3. Measurement of the angle of squint for distance and near. Rotation of the eyes in six cardinal directions, to determine the presence or absence of a vertical deviation.

4. Measurement of the squint while there is complete cycloplegia and with the full correction before the eyes for the distance measurement. Spherical +3.00 D. is placed before the eyes in addition to the full hypermetropic correction when measuring the squint for near. These are *very important* measurements since they tell us whether we are dealing with an accommodative or mechanical squint or a combination of both.

5. Measurement and diagnosis of the vertical deviation, if one exists.

6. Prescription for glasses while the patient is under the cycloplegic *if* glasses are required.

7. Begin occlusion, if required for amblyopia, when prescription for glasses is given.

8. Return after cycloplegia has disappeared (two to three weeks) for treatment. Orthoptic training, occlusion, or surgery as the case may be.

It may take a number of visits to carry out this routine procedure, for one can do only so much at one sitting, depending on the age and intelligence of the child and many other factors.

CONVERGENT SQUINT

Convergent squints may be of the following nature:

1. Accommodative } separate or combined
2. Mechanical }
3. Mechanical { due to convergence excess
   { due to divergence insufficiency

ACCOMMODATIVE CONVERGENT SQUINT

Accommodative squint is a convergent squint due to an anomaly of the convergence-accommodative neuromuscular mechanism. In the early stages it is purely a functional disorder. At this stage it may be *relieved,* not cured, by full correction

* From the Department of Ophthalmology, The George Washington University School of Medicine. Read before the Joint Meeting of Ophthalmologists and Orthoptic Technicians, at Chicago, October 20, 1941.

of the hypermetropia. Glasses will hold the eyes straight. To be content with this treatment, however, is a tragedy, since it condemns the child for life to the wearing of strong glasses continuously. It is symptomatic treatment only.

Glasses (a) break down the accommodation; the patient cannot see clearly for distance or near without them after wearing them continuously for several years. (b) They interfere with the proper physical development of the child and hence defeat the desired objective. Had he gone without glasses and had a vigorous neuromuscular development, he would have possibly developed his own dissociation. (c) The condition is rendered incurable by any and all means if the glasses are worn too long; that is, until the patient has reached physical maturity.

Diagnosis: Accommodative squint.

The degree of squint is carefully measured at 6 meters and at 33 cm. with the prism and cover test before the cyloplegia is used and without glasses. Upon complete cycloplegia and with the full correction of the refractive error before the eyes, the squint is again measured for distance and near. When measuring at 33 cm., spherical + 3.00D. should be added to the full correction of the hypermetropia.

(1) If the squint is *fully* corrected by these means we may with certainty diagnose the case as *purely accommodative.*

(2) If the squint is not fully corrected we may assume there is a mechanical element; that is, a squint remains, but of less degree. When a partial correction of the squint is achieved with glasses, it means there is an accommodative factor that we have corrected by glasses; the squint remaining is mechanical.

(3) If the angle remains the same, there is no accommodative element and the squint is all mechanical.

Glasses may be discarded in a purely mechanical squint since they do not contribute to the cure and are only an *additional handicap* to the child. If there is reduced visual acuity or asthenopia resulting from want of correction, it is obvious that glasses are required to correct these faults.

The diagnosis is not so easy as it appears. It is extremely difficult or impossible to get some children to use their accommodation; hence, the full value of the accommodative element cannot always be ascertained. It may take weeks or months until we can come to an assured diagnosis, particularly in very young children. The child may have fallen into the habit of not using his accommodation, preferring dim vision to diplopia; many do.

It is of extreme importance that amblyopia ex anopsia be prevented and that alternating squint be avoided. These two factors may effectually prevent the cure of an accommodative squint by orthoptic training. Hence, the child will have to wear a crutch for his eyes throughout his life in the form of glasses. This prevention is purely a function of orthoptic training. When properly used in selected cases, orthoptics will cure uncomplicated accommodative squint.

Operation upon eyes with a purely accommodative squint is absolutely contraindicated. To operate would produce a divergent squint for distance and a convergent squint for near; this condition is irremedial.

An untreated monocular accommodative squint will in time cease to be functional and will become organic. That is to say, it ceases to be an accommodative squint and becomes a mechanical one. Probably the mixed cases of accommodative-mechanical squint begin as purely accommodative squints and become partly mechanical, still retaining part of the accommodative factor.

An accommodative squint is susceptible of cure in a majority of the cases: first, by

means of full correction of the refractive error with glasses, and second, by placing the child under orthoptic treatment. The purpose of the orthoptic treatment is to dissociate the convergence and the accommodation, gradually the while reducing the strength of the glasses. In eyes with hypermetropia of not more than three or four diopters and without much astigmatism, we may, in a very large majority of the cases, correct the squint, induce normal retinal relations and no amblyopia, without having the child wear glasses for the *correction of the squint.* This is a consummation devoutly to be wished. To cure a squint without putting the patient to the necessity of wearing glasses and without surgery is indeed a triumph for ophthalmology. Only those who have conscientiously worked with children with crossed eyes can know what it means in the after life of the child. This is particularly true during their school years and adolescence. Ophthalmologists in many instances do not realize what a severe handicap glasses are to children and adolescents. We should discern the difference between the patient's wearing glasses for the correction of the squint and for the relief of asthenopia.

MECHANICAL CONVERGENT SQUINT

The cause is problematical and does not require discussion here. Mechanical squint may be defined as abnormal convergence of the visual axes due to anatomic abnormalities of the motor apparatus or related structures. It is *not* due to disturbed innervation. This must be clearly kept in mind. Accommodative squint is due to an innervational abnormality, while mechanical squint is due to anatomic abnormality. The one is functional; the other organic—that is, anatomic or mechanical faults in the motor apparatus.

Given a purely mechanical squint, correction of the refractive error will have no influence upon it except in so far as the correction of the visual acuity is concerned. That is to say, the degree of the squint will be neither reduced nor altered by the wearing of the glasses. If it is, there is obviously an accommodative element.

Mechanical convergent squint due to convergence excess. Jameson in his writings has clearly and concisely described the means of arriving at the diagnosis. We owe much to this master for his scientific study and writings upon this subject. The convergence near point is normal or less than normal; we consider 5 cm. as normal. The squint is of a higher degree at 33 cm. than at 6 meters. The prism convergence is increased; the prism divergence is normal or slightly decreased. The degree of the squint is not altered by glasses. Correction of the refractive error is for visual purposes only. Orthoptic training is used for securing fusion with amplitude and stereopsis. It cannot correct purely mechanical squint. Stereoscopic vision and fusional amplitude enable the visual apparatus to bring about normal binocular vision *provided* the motor apparatus is not too far from being normal. For example, one could not expect binocular vision in eyes with a mechanical convergent squint of 30 arc degrees even though the fusion be normal. If by means of orthoptic training we have secured stereopsis and fusional amplitude, obviously surgery is necessary to correct the motor abnormality so that the fusion can act. The earlier in life this can be accomplished the more certain it is to succeed.

The surgical treatment consists in modifying the action of one or both median recti. We have used the Jameson recession exclusively for some years and find it entirely satisfactory if intelligently used and with sound surgical judgment. There

has never been a complication. We rarely operate upon but one muscle at a time. We do not favor unguarded tenotomies of the median rectus, believing it to be a dangerous practice. Unguarded tenotomies are unsurgical and should be considered obsolete.

These patients who have been prevented from having amblyopia, alternating squint, and abnormal retinal correspondence by proper measures, who have been trained to have the possibility of normal two-eyed vision, and have been properly operated upon at the right time, will have good results. It is a long process and requires much patient understanding on the part of the parents, the orthoptic technician, and the surgeon. The child must coöperate; a normal child will do so if he has not been spoiled by self-indulgence. Stupid children, spoiled children, mentally or physically sick children, those with psychologic upsets from a broken home or because the household is not a home, can rarely be successfully treated.

Mechanical convergent squint due to divergence insufficiency. Diagnosis: The convergence near point is normal since the convergence system is not involved. The squint is greater at 6 meters than at 33 cm. The prism convergence is normal; the prism divergence is reduced or absent. Glasses do not modify the angle of the squint. Orthoptic training is used for the same reason that it is in convergent squint with convergence excess and for the same purpose. Orthoptic training alone is unlikely to alter the angle of squint. We can improve divergence little or not at all by orthoptic training. Hence, in a convergent squint due to divergence insufficiency the best we may hope to do by orthoptic training is to improve fusion, prevent amblyopia, alternating squint, and abnormal retinal correspondence. When the squint is cosmetically corrected by proper surgery we then may be able to *cure* the small degree of remaining squint by obtaining a wide amplitude of fusion together with third-degree stereoscopic vision.

It becomes obvious that in practically all cases we are dependent upon intelligently directed orthoptic training for the cure of squint. To neglect it is unintelligent on the part of the ophthalmic surgeon; it deprives the child of an opportunity to obtain normal binocular vision. The time is here when the ophthalmologist who ignores orthoptic training in the treatment of squint will find he has become obsolescent and belongs to a bygone age.

The fact that orthoptic training alone is unlikely to alter the angle of mechanical squint should be brought to the attention of the child's parents. Not to do so may cause serious dissatisfaction, for in all mechanical squints surgery is indicated at the proper time. Shortening or advancing the lateral rectus is required by any method the surgeon prefers. If increasing the action of one muscle is insufficient, the fellow muscle will require the same procedure. We do not operate upon both lateral recti at the same time.

The indications for the type of surgical procedure that is required are quite clear, and when the proper procedure is followed the results will be satisfactory in most cases.

Orthoptic training is essential if a functional cure is to be achieved. Orthoptic training will not cure mechanical squint, but it cannot be functionally cured without it.

Divergent squint

Mechanical divergent squint

It is unusual to find a case of divergent squint without an accommodative factor, the majority of patients having myopia.

Mechanical divergent squint is due either to convergence insufficiency or to

divergence excess, and only surgery can effect a cure. When combined with orthoptic training to overcome suppression which is almost always present, the results are good. In our experience mechanical divergent squint is more difficult to correct than mechanical convergent squint. Suppression, which is likely to be intermittent, is difficult to overcome and consequently extended orthoptic training may be required and the case kept under observation over a long period of time.

Divergent squint due entirely to divergence excess is rarely found. Often exophoria is due purely to divergence excess, but by the time it has become an exotropia there is usually an added convergence insufficiency. In a case with pure divergence excess recession of one or both recti results in a most satisfactory cure that is often permanent, *provided* there is no convergence insufficiency or the anatomic anomaly is not so great that recurrence is likely. Obviously, orthoptic training and correction of the refractive error are concomitant necessities in obtaining a cure. May I emphasize the word *cure,* which means binocular vision with stereopsis. Without this the condition is only cosmetically *corrected,* not cured.

ACCOMMODATIVE DIVERGENT SQUINT

This form of squint differs in many respects from accommodative convergent squint. The child is myopic and uses no accommodation for near vision; consequently no convergence. He fixates with one eye; the other is relatively divergent. Hence, suppression occurs for near vision, which is therefore intermittent suppression. Slight amblyopia may occur, which later becomes more marked as the squint progresses from an intermittent to a continuous one.

The child has a divergent squint only for near at the beginning; hence, it is functional—that is, accommodative. The child, however, squints only when he is looking down; that is, for near work. Consequently it is not observed by the parents. Very likely his myopia will not be discovered until he goes to school. By this time the squint will probably have a mechanical factor in addition to the accommodative factor. It is obvious that we rarely see a purely accommodative divergent squint. It is equally obvious that surgery is not indicated if the case be entirely accommodative. Correction of the refractive error and orthoptic training will establish a cure. Full correction of the myopia is the first requisite in order that the accommodative-convergence relation may be restored. If this is not done the lack of stimulus of the convergence militates against the development of this function. Also the patient does not see clearly, and hence fusion is not properly developed.

MECHANICAL DIVERGENT SQUINT COMBINED WITH ACCOMMODATIVE SQUINT

Surgical correction and in addition correction of the refraction and orthoptic training are required. Surgery properly adapted to the particular case is usually satisfactory and accomplishes a cure in conjunction with the other treatment mentioned. The degree of the squint is usually not great, and there should be no failures in such cases. Failure could only come from improper diagnosis and illy conceived or improperly performed surgery.

Bielschowsky advised that no operation be done to correct divergent squint before the adolescent age because of the possibility of recurrence. This judgment was no doubt formed in Germany. In our country conditions are so different that it would not seem proper judgment here. Due to the adverse effect on the mental development of the child, any squint should be corrected and cured at the earliest possible moment.

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Discussion

Louisa Wells* (Washington, D.C.): Dr. Davis has emphasized the types of concomitant squint; namely, mechanical and innervational. From the standpoint of the orthoptic technician, as well as the ophthalmologist, a differential diagnosis must be made before treatment is instituted, since the orthoptic training given is varied in technique with each factor. This is all-important if a cure is to be obtained. If the condition is one that can be cured an accurate diagnosis will expedite it.

A case of purely mechanical unilateral squint will usually exhibit poor fusion, marked suppression, and amblyopia. Abnormal retinal correspondence may be found in approximately 50 percent of the cases of mechanical squint. If there is a purely accommodative anomaly, the fusion and the projection will usually be found to be stable. Obviously the orthoptic technique will not be the same for the different types of squint. For example, it would be impossible for a patient with a mechanical convergent squint to relax his accommodation and thus straighten the eyes, as can be done by one with an accommodative squint. The mechanical restriction plus the fact that his refractive error would probably be negligible, would prevent him from accomplishing this. Likewise, it would be a waste of time and energy in a purely accommodative squint merely to give fusion exercises, for the attainment of third-grade fusion will not cure his squint. A large majority of accommodative convergent squints have third-grade fusion when first seen, since the squint is only intermittent. Another example would be bar-reading. For the child with mechanical squint this would not be prescribed because of the impossibility of binocular single vision when using such a device; it would only serve to frustrate the patient. The purely accommodative squinter, however, can attain parallelism of his visual axes when relaxing accommodation, and therefore this form of exercise is extremely efficacious in training him to accommodate and not overconverge.

In our clinical experience we have found the large majority of the cases of convergent squint to have two factors, the mechanical and the accommodative, plus nervous excitations that are probably neurogenic. It appears impossible to cure the accommodative factor *before* the mechanical. In a case with this combination of factors, it is necessary first to cure the suppression, abnormal retinal correspondence, if it exists, amblyopia, and poor fusion. As soon as these elements in the case are cured, surgery is indicated. Dissociation of convergence and accommodation should not be attempted until surgery has secured correction of the mechanical factor.

We might take a hypothetical case of squint that measures 40 diopters by prism and cover test for distance and near, without cycloplegia and without glasses, and with full accommodation for a letter chart or pictures. Under the influence of atropine and with the full correction of the refraction before the eyes, the deviation measures only 20 diopters; only half the amount of deviation measured when accommodation is fully active. The squint has only partially disappeared under the influence of the cycloplegic and glasses; hence, we deduce that approximately half of the angle of squint is due to a mechanical factor and the remaining half of the squint to the accommodative factor. This case, let us say, has been treated for amblyopia by total occlusion until the vision in the two eyes has be-

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come approximately normal and equal. The fusion has been stimulated until it is second or third grade. At this point he has probably arrived at a plateau stage; that is, stimulation of the fusion for some weeks will not improve the fusional divergence or reduce the angle of squint. We then decide that the mechanical restriction is responsible, and surgery is performed. When the surgeon operates on this patient he will bear in mind that only half of his angle of squint is due to the mechanical factor. When the patient returns to the orthoptic clinic following surgery, we do not expect the eyes to be straight, but the angle of the squint should be reduced about half, if the operation has been successfully performed.

The innervational factor is now all that remains, and this can be cured only by orthoptic training.

It is very important to obtain good fusional divergence before beginning the dissociation of the convergence and accommodaiton. We find 5 to 10 diopters of fusional divergence on the synoptophore, and 4 to 5 prism diopters at 6 meters on a light is generally sufficient. Likewise the fusional convergence must also be stimulated.

We have spoken and written a good deal about the technique of dissociation of the convergence and accommodation, hence it will not be discussed here. I do wish, however, to emphasize certain psychologic points in this treatment that are of paramount importance.

First, the orthoptic technician must exert all the force of her personality at her command, unflagging enthusiasm, ingenuity, and more energy than she is required to put into any other form of treatment. The child can learn to dissociate his convergence and accommodation only by hard work on his part and harder work on the part of the technician and parent. If you can keep his enthusiasm going and that of the parents through the first hard month, he will begin to see that he is achieving something definite and will cooperate, *provided,* as Dr. Davis points out, he is intelligent. If his I.Q. is low and his concentration poor, it will be impossible to make him understand. This type of treatment, therefore, is very difficult to administer in the clinic to indigent patients, except those who are intelligent. In private practice there is a much larger opportunity for success.

Second, during the course of treatment, the average child is likely to be suddenly uncoöperative in the home and clinic, and the squint will become worse. This is a psychologic upset, and the squint may become worse because of a neurogenic factor. The constant reiteration of parents and technician in asking him to keep his eyes straight upsets him. After the first flush of achievement has passed, he becomes bored with the whole thing and decides that he is being persecuted by an adult world; in consequence he rebels, makes an effort to turn his eye in as much as possible, in order to enjoy clearer vision and also to get even with his persecutors. Some children during this period *involuntarily* cross their eyes because of the nervous excitations at this upsetting time. When this state of affairs is manifest, we have found from experience that a holiday from all treatment in the clinic and in the home is necessary. Two weeks is generally sufficient. As much out-of-door exercise as possible is prescribed. The mother is requested not to mention eyes and to permit the child to do as he pleases. If he wishes to wear his glasses or if he would rather go without them, permit him to do so. If he crosses his eyes, no mention should be made of it. Under these conditions children begin straightening their eyes voluntarily after a few days, since adults have not made the customary remarks when

the eye is turned in. As it may have been done on purpose, all the fun has been taken out of the experiment. In order to secure attention, therefore, the patient will straighten the eye hoping for praise for the effort. There are, of course, a certain proportion of the patients who do not voluntarily cross their eyes but do so because they cannot help it. The holiday therefore quiets them. An understanding of child psychology is very necessary in the treatment of dissociation of the convergence and accommodation.

Dr. Davis has spoken of the marked suppression occurring in cases of divergent squint. We have found that it takes longer to break down suppression in divergent-squint than in convergent-squint cases. When this is accomplished, and high fusional convergence with good fusional divergence has been attained, if the angle of the squint remains the same or is only slightly improved surgery is necessary to complete the cure. We have found that we can relieve the *symptoms* of a divergent squint by attaining very high convergence reserve and breaking down the suppression. The patient may have binocular vision most of the time, but the condition is not cured; he will squint under cover and when fatigued. It is not always practical to operate upon him if he is an adolescent or an adult. Some patients are entirely satisfied as long as the symptoms have been relieved by orthoptic training and they have binocular single vision most of the time.

May I repeat, if a differential diagnosis of the squint is made, the orthoptic technician can give the proper exercises, without loss of time and energy to the child and herself. There does not seem to be much point in giving a child the same old exercise week after week when no objective improvement is shown, just because of the *hope* that it *might* do some good. We must try to find out *why* cases do not continue to improve. Five and six years ago we did not understand the difference between an anatomic and innervational factor and could not understand why some cases were so stubborn. After we had obtained third-grade fusion and equal vision we expected the angle of squint to be materially improved or cured. This did not happen; often the angle of squint remained absolutely unchanged. These of course were the purely mechanical squints. We had a few patients who seemed suddenly to be spontaneously cured. These were cases of hyperopia in which glasses had been discarded many times without telling us, and the patients had inadvertently learned to dissociate the convergence and accommodation themselves. In the light of our present knowledge it is very interesting to study the old records. They serve to show us how much time we wasted because we did not know the factors we were dealing with and did not give specific treatment to each element in the case. The duration of a squint can be greatly lessened by making a proper diagnosis and treating each factor in the proper order. This, as Dr. Davis points out, is of the utmost importance.

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IMPROVED MODEL OF THE KUKÁN OPHTHALMODYNAMOMETER*

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The instrument to be demonstrated is a modification of Dr. Kukán's ophthalmodynamometer[1] which, unfortunately, is not available and not too well known in this country, although it is probably the very best heretofore in existence. Kukán based his apparatus on a technical principle that differs materially from any used by previous workers and by so doing was able to avoid most of those purely mechanical disadvantages of other instruments that made the measurement of the retinal vascular pressure difficult, uncertain, and controversial.

Ophthalmodynamometry, as a method of more or less general recognition, owes its origin to the genius of Bailliart. Because of the many objections to the original technique of Bailliart,[2] however, different modifications of his apparatus have already been constructed. Still, the determination of the intraocular vascular pressure with any instrument based on the principle of Bailliart—namely, containing a plunger that is pressed against the eyeball—requires the utmost skill and experience, is unreliable in the hands of those not specially trained, and is, therefore, not suited for the practitioner. But even when used by the most experienced much can be said against its reliability. If the patient is timid or restless, the instrument slides off again and again, and the compression has to be repeated until the eyeball, compressed several times, becomes softer and the measurements become incorrect. Furthermore, measurements are accurate only if the plunger points exactly towards the center of the eyeball. If this is not the case—that is, if the plunger is not placed upon the surface of the eyeball perpendicularly—the force exerted by it resolves into a compressing and a rotating component (fig. 1). Thus, actually, not so much compression is being exerted as is indicated by the scale of the instrument. Another, even more important objection to this technique has already been emphasized by Duke-Elder;[3] namely, the fact that in the application of the pressure the tense eye is pushed back into the orbit, partially occluding the flow of blood in the feeding arteries. We may add to this statement, that it is also impossible to avoid congestion of the veins of the orbit, and this, together with the strangulation of the blood vessels mentioned by Duke-Elder, changes the very vascular pressure that is in the process of being determined.

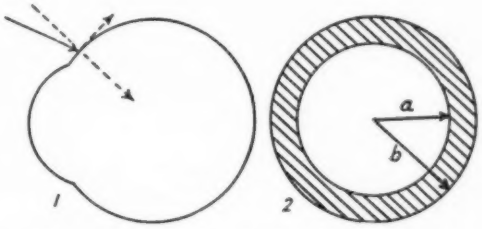


Fig. 1 (Linksz). When the plunger of a dynamometer of the Bailliart type (indicated by solid arrow) is not applied to the eyeball perpendicularly, the force exerted separates into a compressing and a rotating component. (The dotted arrows indicate only the respective directions of these components.)

Fig. 2 (Linksz). The opening of the hemispheric suction cup (the area of the surface of the eyeball on which negative pressure is exerted) is $a^2\pi$ (inner circle). The rim of the suction cup pressed against the eyeball by the atmospheric pressure has an area of $(b-a)^2\pi$ (shaded area).

Kukán's new idea was to increase the intraocular pressure by producing a

*Part I of a paper read before the New York Society for Clinical Ophthalmology at the forty-fourth regular meeting, New York, New York, November 3, 1941.

vacuum in a small metal hemisphere, the rim of which is pressed against the sclera. It seems strange, at first glance, that an increase in the intraocular pressure may be produced by a vacuum, by negative pressure. It will therefore be advisable, first, to consider briefly the mechanics of this procedure.

Everyone probably remembers from elementary physics the famous experiment in the 17th century by the Mayor of Magdeburg, von Guericke, the inventor of the vacuum cup. He demonstrated the pressure of the air on two large hollow hemispheres and showed that when the air between them is pumped out, the pressure of the atmospheric air holds them so firmly together that 16 horses were actually necessary to pull his hemispheres apart. I might also mention another experiment from elementary physics. If a sheet of glass is placed on a hemisphere and the air is pumped out gradually, the glass plate will be pushed toward the rim of the hemisphere (to be more exact, the rim of the hemisphere and the glass plate will be pushed toward each other) by the pressure of the atmosphere until this force finally causes the glass plate to burst.

If the hemispheric cup of the Kukán instrument is placed on the sclera and the air pumped out, the rim of the cup and the eyeball are pushed toward each other by the atmospheric pressure with exactly the same force as that produced inside the cup, as negative pressure. In other words, a positive pressure is exerted upon the eyeball by the rim of the metallic cup. Now, according to Pascal's law: When pressure is applied at one point of a confined liquid (as, for example, in the eyeball), this extra pressure is transmitted throughout the fluid to every point of the wall of the containing vessel. Translated into more familiar terms this means that if, by any method, pressure is exerted upon the contents of the eyeball the intraocular pressure will rise. And it will rise regardless of whether this pressure is exerted by a compressing instrument, as that of Bailliart, or by the atmosphere after the production of a vacuum adjacent to the surface of the eye.

Kukán, in his paper, gave a mathematical analysis of the amount of the force exerted upon a fluid-containing sphere by the rim of an attached hollow hemisphere if the air has been pumped out of the latter.

Let the inner radius of the suction cup be designated by a, the outside radius of the cup by b. The opening of the cup, hence that part of the fluid-containing sphere (the eyeball), on which the suction is exerted, will then be $s_1 = a^2\pi$, the total surface covered by the cup $s_2 = b^2\pi$, and the surface covered by the rim $s_2 - s_1 = (b^2 - a^2)\pi$ (fig. 2). If the negative pressure produced in the cup is p_1 for the surface unit, the total force of the suction exerted upon the sphere will be s_1p_1. Now, in order to counteract, or, as the physicist would say, to neutralize this force (in other words, in order to abolish the vacuum produced), the rigid rim of the cup and the fluid-containing sphere are pushed against each other with an equal force by the atmospheric pressure. Thus a pressure is exerted upon the sphere which is equal to the suction and it will be possible to compute this positive pressure, p_2, for the surface unit, from the following equation:

$$s_1p_1 = (s_2 - s_1)\, p_2;$$

from which

$$p_2 = \frac{s_1\, p_1}{s_2 - s_1} = \frac{a^2\pi p_1}{(b^2 - a^2)\pi} = \frac{a^2 p_1}{b^2 - a^2}$$

We may add to Kukán's analysis, that $\frac{a^2}{b^2 - a^2} = c$ is constant for every indi-

vidual cup used, so that the positive pressure, p_2, exerted upon the ball, according to this equation, is proportional to the negative pressure, p_1, produced by suction, and if c has been determined, it is very simple to compute its actual value. We may add, further, that in the case of the eye this had to be added, of course, to the initial intraocular pressure p_0, in order to get the actual intraocular pressure for a certain amount of negative pressure applied. Therefore, the equation for the eye would be:

$$p_2 = p_0 + c\, p_1.$$

I carried out this computation and found that, fortunately, it is not valid for the eye. If it were valid, the value for **c** for a cup which I have been using for the most part and which has a diameter of 13 mm. and a thickness of 1 mm., would be 3.02. Thus a negative pressure of 50 mm. Hg would increase the initial intraocular pressure, P_0, by more than 150 mm. Hg, which would be deleterious.

Kukán's aforementioned analysis is fully valid only if the fluid-containing sphere is ideally rigid and incompressible, which the eyeball is not. When pressure is exerted upon the eyeball, the wall of the latter bulges slightly into the hollow hemisphere of the cup; moreover, a very small amount of fluid, some of the aqueous humor and probably some blood, is squeezed out of the eye. Both of these factors cause the suction to be less effective, so that it is not followed by so much increase in intraocular pressure as is computed from the formula just given.

The "actual values" of the increased intraocular pressure must therefore be found experimentally. For this purpose the patient is put into a reclining position and the suction cup attached to his sclera. The intraocular pressure is measured before the experiment starts. Now one applies gradually increasing suction, thus producing increasing amounts of negative pressure. This can be done—for example, in steps of 25 mm. Hg—and the intraocular pressure successively measured with the tonometer as these increasing amounts of negative pressure are applied. "Actual values" must, of course, be stated parenthetically, since it is known to everyone how approximate are the values arrived at with our usual tonometric methods. To cite one example, such an experiment with an eye having an initial intraocular pressure of 22 mm. Hg, would present the following values:

Negative Pressure (p_1) in mm. Hg	*Intraocular Pressure ($p_0 + cp_1$) in mm. Hg*
0	22
25	28
50	33
75	38
100	44
125	49
150	53

The relation between these two values is a fairly linear one and the value of c, called in analytical geometry the slope of the linear relation, $p_2 = p_0 + cp_1$, can be easily determined.

Such experiments were carried out by Magitôt and Bailliart[4] with the Bailliart apparatus. The relation between the compressing force in grams and the increase of intraocular pressure in mm. Hg was fairly linear in the experiments by these authors. However, as has already been stated, this instrument causes strangulation of the retrobulbar blood flow, and that is obviously the reason why the authors found the actual increase in intraocular pressure lagging behind the values that would be postulated by a linear relation, especially in eyes with lower intraocular pressure. A similar lag is found in the curves obtained by a somewhat different method by Keil[5] with his modification of the Bailliart instrument. Now, strangulation is avoided completely—and this is the greatest advantage of the method—

if the intraocular pressure is increased by the suction method. Kukán's curves show that when his apparatus is used to increase the intraocular pressure, a direct linear relation exists between the latter and the negative pressure exerted. I computed c from these curves and found that its value for the suction cup of 13-mm. diameter is 0.21, and for the smaller one with a diameter of 11 mm. it is 0.15.

What, now, are the advantages of Kukán's instrument? I have just mentioned the most important one—namely, that since the eyeball is not pressed into the orbit, no congestion or strangulation of the retrobulbar blood vessels can be produced. There is, furthermore, no possibility that the cup will glide off the eyeball, as the plunger of the Bailliart instrument regularly did if the eye of the patient moved, or if the observer pushed the eye into the orbit. Moreover, it is impossible to place the instrument upon the eyeball in an improper position, so that any negative pressure produced will always exert the same, and the expected compression. More important still is the circumstance, that by the very suction, the eyeball is being fixed instead of pushed, so that even unavoidable movements of the patient are unable to cause any disturbance in measurement. The very observation of the pulsation phenomena on or around the disc is greatly facilitated by this proper fixation of the eyeball, the reliability of the procedure thus being greatly enhanced. Anyone can master the technique after a very few determinations have been made, and no uncertainty will be entertained in regard to the results obtained.

Unfortunately, an assistant is needed to operate the syringe, and this assistant must not only be skilled and coöperative, but actually familiar with the phenomena observed. Otherwise it is impossible for him to regulate the pressure properly.

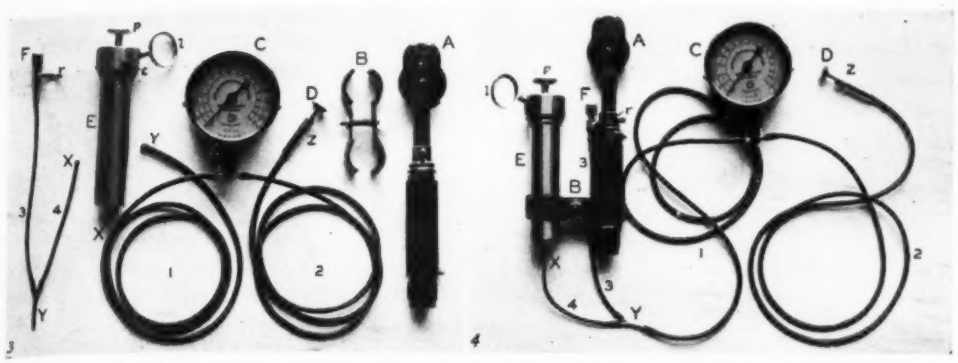
In my clinical and private practice in Budapest I used the Kukán instrument for years, and as long as I had the good fortune to have Dr. Rasko, who is a student of diseases of the blood circulation, as my collaborator,[6] I was unreservedly enthusiastic about it and did not find it a disadvantage that an assistant was necessary to operate the instrument. But when I came to this country and had, for example, the opportunity, on a large scale, of making measurements of the retinal vascular blood pressure on the unique material of tabetics at Bellevue Hospital in New York, it was always necessary, first, to find someone who was willing to help me and to teach this assistant (usually a student nurse), how to handle the instrument. For the most part such assistance was quite unsatisfactory, and from the measurements obtained I became convinced that the need for an assistant was a great handicap. I decided, therefore, to construct an instrument* that retained the principle and the excellent qualities of the Kukán ophthalmodynamometer, but was operable by the observer himself.

Some of the points that were taken into consideration in the construction of the instrument should be described briefly, and the illustrations (figs. 3-10) will serve to make the technique more intelligible.

One hand of the observer holds the suction cup in its position attached to the patient's sclera.† As no pressure should be exerted upon the eyeball, it was found best to exclude this hand from performing any of the necessary manipulations. Thus everything must be done by the

* J. Brandenburg and Company of 122 East 25th Street, New York, New York, were instrumental in the construction of such an improved instrument, and I am very much indebted to them for their coöperation.

† The position most advisable for the cup is the region temporally from the cornea, about 1 mm. from the limbus.



Figs. 3 and 4 (Linksz). Fig. 3: A, electric ophthalmoscope; B, clamp for attachment of syringe (E) to ophthalmoscope; C, vacuum manometer with rubber tubing 1 and 2. The end Y of tube 1 is attached to the Y-shaped cannula connected to the release (F); tube 2 ends in handle (z) for the suction cup. D, changeable suction cup screwed into handle (z). E, syringe with piston (p), lever 1 to elevate the piston and catch (c). After measurements are finished the catch must be pushed in the direction indicated by arrow; this liberates the piston which can then be pushed back into its initial position. F, release-screw with ring (r) to fasten it to the ophthalmoscope and rubber tubes 3 and 4. Tube 3 ends in Y-shaped cannula, the end (x) of tube 4 is attached to the syringe at x.

Fig. 4: Ophthalmoscope and ophthalmodynamometer assembled. The letters indicate the same parts as in figure 3. The parts B (clamp) and r (ring) have to be made individually to fit any desired ophthalmoscope.

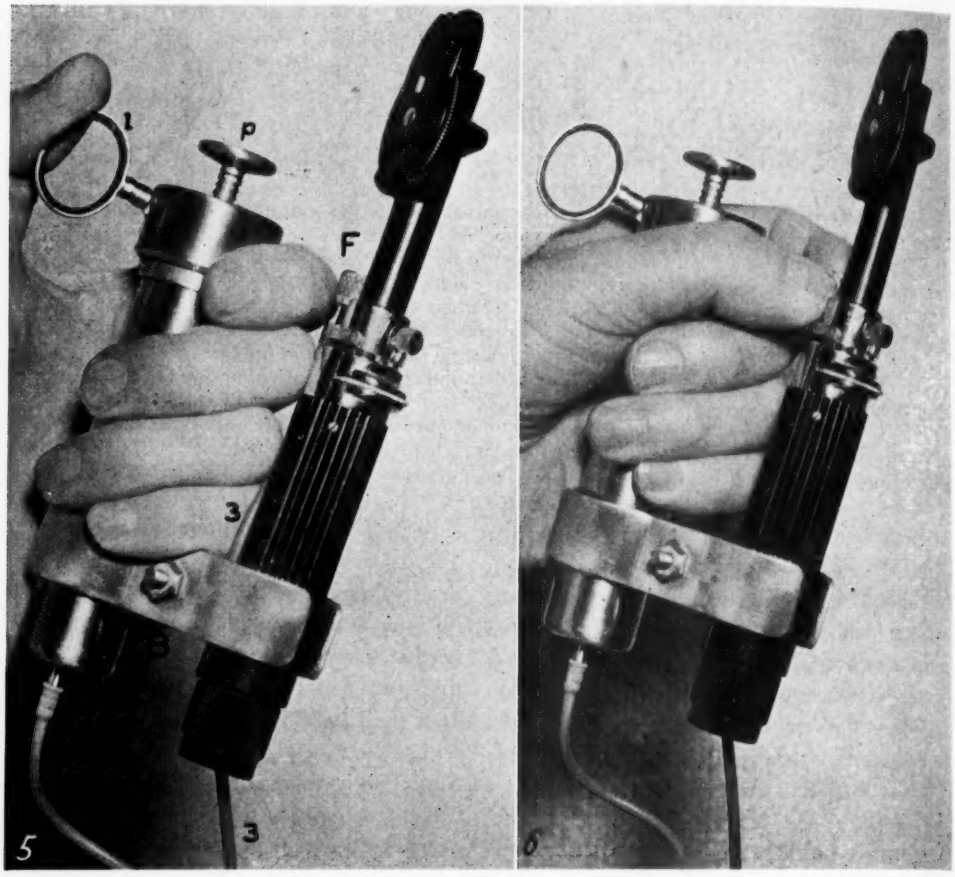
other hand.* It holds the syringe and the ophthalmoscope and handles the battery of lenses as well as the plunger of the syringe and the release. This sounds more difficult than it actually is. Ophthalmoscope, syringe, and release are firmly attached to each other by a clamp and a ring, respectively, especially provided for this purpose, in order to make operating with one hand possible. The last three fingers are sufficient to grasp the syringe and the attached ophthalmoscope. The forefinger may then be used, if necessary, to adjust the lens battery, and the thumb, finally, by a lever arrangement, operates the syringe and produces negative pressure by lifting the plunger in the syringe. The lever operates a rack and pinion, so that when the former is released the plunger is kept in place and the negative pressure is maintained. The cogs are so distributed that one full excursion of the lever will produce a negative pressure of about 25 mm. Hg, and increase the intraocular pressure by about 5 mm. Hg when the cup of 13-mm. diameter is used.† As the syringe can now be operated under the control of the ophthalmoscope, and the elevation of the intraocular pressure can be performed only in these 5-mm. steps, it becomes automatically impossible to make serious mistakes. The intraocular pressure is increased gradually and one can stop at any

*If the vascular pressure in the patient's right eye is to be tested, the observer holds the cup in his left hand and operates the syringe with the right hand. If the left eye is to be tested, the reverse method is used. It is not necessary to loosen the clamp holding the ophthalmoscope and the syringe together; it is much simpler to loosen the screw that fastens the head of the ophthalmoscope and to turn only this head into a convenient position, after which the screw should again be tightened.

†According to the values assigned to c (cf. p. 708), in case the applied negative pressure is, say, 25 mm. Hg, the intraocular pressure has been increased by $0.21 \times 25 = 5.25$ mm. Hg if the larger cup is used, and by $0.15 \times 25 = 3.75$ mm. Hg if one works with the smaller cup. Thus the increase is slow, gradual, and within reasonable limits.

moment. This is the real advantage of my model. Even the most coöperative assistant is unable to start or stop at the very moment when one has just seen an artery or vein pulsate, attenuate, collapse, increased pressure, aside from its efficacy in the determination of the pressure in the retinal blood vessels.

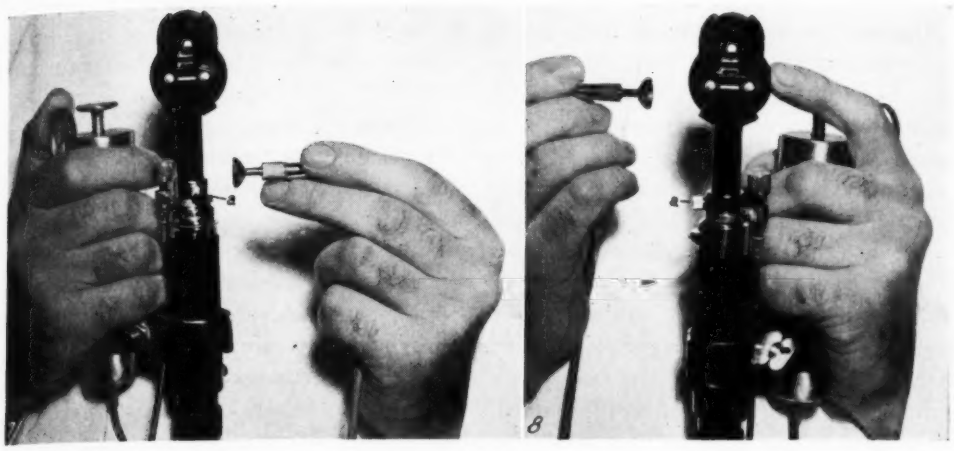
Four to five movements of the thumb are generally sufficient to raise the intra-



Figs. 5 and 6 (Linksz). Fig. 5: Ophthalmoscope and syringe attached by clamp. The thumb operates the lever which, by a rack-and-pinion arrangement, elevates the piston. The release (F) can be seen between the ophthalmoscope and the operator's index finger. The letters indicate parts as described in figure 3.

Fig. 6: The negative pressure produced by the syringe is diminished by operating a small screw, the release (F, in figures 3, 4, and 5), with the thumb and index finger.

or any other phenomenon the observer may become interested in correlating with the exerted pressure. I am confident that the use of this improved instrument will help to reveal further hitherto disregarded details of the pulsation phenomena, the behavior and the elasticity, and the like, of the blood vessels under ocular pressure so high as to cause a pulsation of the central artery of the retina, which then indicates that the diastolic pressure has been passed. Should the observer now wish to decrease the pressure slowly, as it were to check the value he has just arrived at, he will find a small screw at hand, which can be operated by

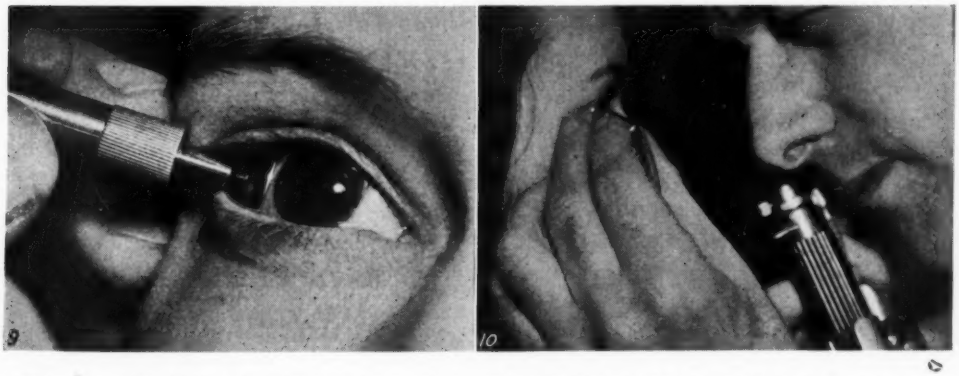


Figs. 7 and 8 (Linksz). Fig. 7: The instrument as held in the observer's right hand for measurements on the patient's right eye. The figure shows how the release is attached to the ophthalmoscope and the latter to the syringe. The thumb is ready to press the lever. The release is conveniently located near the observer's index finger. The screw, a, of the ophthalmoscope has been loosened and the head of the latter turned to face the patient's eye.

Fig. 8: The instrument as held in the observer's left hand for measurements on the patient's left eye. The release, attached by a ring to the ophthalmoscope, can be seen clearly in this picture. The head of the ophthalmoscope, after loosening the screw, a, has been turned to face the patient's eye. This figure also shows how the lens battery of the ophthalmoscope can be operated freely by the index finger, if necessary, while the instrument is firmly grasped by the other fingers.

the thumb and forefinger, with which to release the negative pressure as slowly and gradually as he wishes. Thus the entire observation can be made while increasing or decreasing the intraocular pressure at will.

One further improvement has been made on this model, so as to render measurements more quickly and more conveniently. It may be recalled that the scale of the Bailliart instrument is marked in grams, and so are the scales of the other similar instruments based upon Bailliart's principle. The manometer of Kukán's in-



Figs. 9 and 10 (Linksz). Fig. 9: The suction cup is attached to the sclera about 1 mm. from the limbus temporally. The stem of the cup is held by the thumb and index finger while the remaining three fingers rest on the patient's orbital margin and cheek. Thus every pressure upon the eyeball is avoided.

Fig. 10: The instrument in operation.

strument, on the other hand, is marked in millimeters of mercury vacuum. In either case the increase of the intraocular pressure has to be computed with the aid of tables provided with the respective instruments. However, as I have pointed out previously, if one uses the suction cup this is actually unnecessary. If the value of c is known (and this can be determined in a few experiments once and for all for any individual cup used), c p_1 will be the actual increase of the intraocular pressure in millimeters of mercury for any given amount of negative pressure, p_1, applied. According to the equation $p_2 = p_0 + c\,p_1$ one simply has to add this former value to p_0, the initial intraocular pressure, in order to have the actual intraocular pressure. Now the dial of my instrument has been so constructed that even the computation of c is already carried out for the two cups provided with the instrument, and the values of c p_1, in mm. Hg, with which the intraocular pressure has been elevated, are shown directly by the hand of the dial. Kukán, who spent years of work on the construction of his instrument, found cups of 13- and 11-mm. diameter to be most convenient. These have been retained with the new model. The first may be used where higher pressures are anticipated, or one intends to measure the systolic blood pressure. When the smaller cup is used the pressure jumps in shorter steps; it should therefore be used when one intends to determine the venous or the capillary pressure or when it is anticipated that the retinal diastolic pressure will be low. The pressure values for both cups are indicated on the dial of the instrument. As some may prefer to register the negative pressure actually applied, these values are also indicated on the dial.

To give an example: One has determined that the intraocular pressure of the eye, p_0, is 18 mm. Hg. The instrument reveals that a negative pressure of 75 mm. Hg was necessary to elicit pulsation of the central artery and a cup of 13-mm. diameter has been used. The outer circle on the dial indicates, automatically, that a negative pressure of 75 mm. Hg corresponds to an elevation of the intraocular pressure of 16 mm. Hg if the cup of 13-mm. diameter is used. The diastolic pressure in the retinal central artery is thus $18 + 16 = 34$ mm. Hg.

Summary

Though the interest of the investigators concerned with ophthalmodynamometry is naturally focused more upon the physiologic and pathologic aspects of the measurement of the intraocular vascular pressure, this communication is an attempt to consider ophthalmodynamometry purely from the point of view of the mechanics involved. To understand this more thoroughly may provide a basis for better evaluation of its results for purposes of diagnosis and research.

An instrument has been described which, while based entirely on the principle of Kukán, can be operated by the observer himself, so that more complete coördination is secured between compression and observation.

A new dial has been designed for this instrument from which the increase in intraocular pressure can be read off directly, so that the use of curves for computation, hitherto necessary, is eliminated.

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SULFANILAMIDE IN THE TREATMENT OF TRACHOMA*

Results after three years of trial

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That sulfanilamide might be of benefit in the treatment of trachoma was first seriously studied in the Dutch East Indies by Lian[1] and Dik,[2] both of whom recommended that the drug be used as an adjunct to the usual local treatments since by itself the chemotherapeutic agent is unable to arrest the disease. A large number of investigations in this connection have since been undertaken with results in many cases contradictory or equivocal, as a recent critical analysis[3] of the literature has clearly pointed out. When, however, the U. S. Indian Service, beginning with Loe,[4] published a series of reports indicating the specific nature of sulfanilamide in cases of trachoma, it was proposed to adopt the treatment in this hospital as a routine procedure in the management of the disease. The earlier observations soon amplified themselves into a prolonged study that is now completing its third year. With accumulation of data, it seemed that the results obtained during this interval might be of interest to the ophthalmologist, since the number of patients so treated forms the largest single group heretofore reported, and the study itself has continued persistently for what appears to be the longest period recorded.

* From The Irvine-McDowell Memorial Hospital for Treatment of Trachoma.

Methods of study

All the individuals studied were native whites almost exclusively from Kentucky. There were 338 in all, representing age groups from early childhood to senescence, and manifestations of the disease which varied from recent, primary infection to old, frequently recurrent infection, as will be brought out to better advantage later in this paper. Each patient was under constant observation in this hospital throughout the course of treatment.

The basic treatment consisted of the oral administration of sulfanilamide, one-third grain per pound of body weight for the first 10 days, which was then decreased to one-fourth grain for the following 14 days. In each instance, the dosage was divided into four equal quantities during the day. In a special group of patients this was supplemented by local application of the drug (0.8-percent solution) in the form of drops six times a day. The only other consistent

treatment practiced, excepting in the group receiving drops of sulfanilamide, was the usual, routine irrigation with tepid boric-acid–saline mixture. As will be shown later, other patients received various forms of topical treatment in addition to sulfanilamide. In order to insure actual administration of the drug, the patients were trained to assemble in the clinic room according to a specified schedule when their respective dosages were distributed and then they were allowed to leave only when the sulfanilamide had been ingested in the presence of the hospital staff.

Experimental

Very early in this study, certain experiments planned for purposes of control were carried out. To illustrate how this end was achieved, a typical trial treatment is given in detail. Thus, patient O. B., a 17-year-old girl, was admitted with untreated, primary trachoma of two years' duration, which was classified as type IIa. The conjunctivas of both eyes were characterized by marked granular activity, while both corneas, having neither scars nor ulcers, exhibited heavy pannus 3 to 4 mm. in extent. The treatment consisted of sulfanilamide administered as aforedescribed, and while the left eye received no local attention except for the application of the drug as drops, the right eye was grattaged and subsequently treated with neo-silvol and later with silver nitrate in the usual routine manner. At the end of the 24 days of sulfanilamide therapy, the right eye (previously grattaged) was completely asymptomatic; the conjunctiva was smooth, a small amount of scar tissue being present, and the pannus, while still discernible, was inactive and receding. The left eye, on the contrary, showed no improvement over its original appearance, as to either the lids or the cornea.

Other control experiments were conducted in which the patient was given sulfanilamide by mouth; one eye was subjected to applications of one of the metallic salts (that is, silver nitrate or copper sulfate), while the other received sulfanilamide drops. At the end of the 24-day period, it was again observed that the eye allowed to continue on its own course, with only sulfanilamide to interfere, was not materially altered in its clinical activity, whereas the opposite eye, benefited by the metallic agent, was entirely free of active trachoma.

The conclusion from such experiments was hardly escapable, therefore, that sulfanilamide by itself was inadequate in at least regularly arresting trachoma, or even in checking its course. It was, nevertheless, decided to study a series of cases treated with the drug alone. Thus, it would be possible to avoid the difficulty so commonly encountered in the literature of appraising a treatment complicated by additional agents (that is, silver, copper, zinc, grattage, and such measures) already known to be effective in arresting trachoma. Accordingly, 49 patients were treated with sulfanilamide only, the majority of whom received this preparation not only by mouth as described, but also by local application.

The data bearing on this experiment are summarized in table 1.

Analysis of the protocol reveals that 12 patients were of the type-I variety, in 7 of whom the infection was so recent that to all intents and purposes corneal changes were lacking. The diagnosis in these cases was reasonably certain because of the appearance of the lids and particularly because of the family history. At the end of the treatment, only one patient was apparently healed; four were improved and seven showed no obvious changes from the original appearance. Of six patients, classified as type IIa, the disease

in one appeared to be arrested, in three it was definitely improved, and in two unchanged. In one individual in this group, the corneal disease was further complicated by active ulceration. Consequently, additional treatment was necessary to alleviate the resulting pain. While the disease was ameliorated during the sulfanilamide therapy, it remained distinctly active. Four patients, all representing type IIb′, while definitely benefiting to some extent with the drug, were not rendered symptom-free. The type-III patients numbered 26 in all, of whom 7 exhibited typical examples of the exacerbative, "flareup" type. In this group, the condition in 12 was completely arrested, including that in all 7 exacerbative examples; in 9 it showed varying degrees of improvement, while in 5 it remained unaffected by the drug. This result is in unusual agreement with that of Julianelle and his associates,[5] who first recorded the striking effect of sulfanilamide in this form of trachoma. A single patient belonging to type IV was treated with the drug alone; he showed improvement but there was no arrest of the disease by the treatment. Hence, of the 49 cases of trachoma in this group, 14 were arrested, 21 were improved, and 14 were unchanged during treatment with sulfanilamide alone.

It seems, therefore, that with the notable exception of exacerbative disease, sulfanilamide can hardly be considered as specific chemotherapy for trachoma. Thus, if allowance is made for the seven "flareups" in the type-III group, since their condition was obviously of a different nature clinically and therapeutically, the resultant analysis discloses that among 42 patients, there was an arrest of the disease in 7, improvement in 21, and no change in 14. It is difficult to reconcile these figures with the concept of a theoretically specific agent, when it is realized that only about 17 percent of cases were actually arrested, 50 percent were improved, and the remaining 33 percent were completely unaffected. Comparison with similar statistics obtained by Julianelle and co-workers both on the Navajo reservation[5] and in Missouri[3] reveals comparable results.

Because this writer then believed that sulfanilamide, given orally only or in conjunction with local application, arrests trachoma exceptionally rather than as a rule, he decided to study its effect when reinforced with one or another of the topical treatments in current use. Accordingly, therefore, a second group consisting of 274 patients was given sulfanilamide by mouth, and, in addition, some local procedure was followed, in

TABLE 1

SUMMARY OF PATIENTS TREATED WITH SULFANILAMIDE ALONE

Stage of Trachoma	Number of Cases	Condition of Cornea					Previous Treatment		Results of Treatment		
		Pannus			Scars	Ulcers	Yes	No	Unchanged	Improved	Arrested
		Slight	Moderate	Heavy							
Type I	12	5*	2	None	None	None	4	8	7	4	1
Type IIa	6	1	2	3	2	1†	3	3	2	3	1
Type IIb′	4	None	3	1	1	None	3	1	None	4	None
Type III	26	1	5	20	17	None	20	6	5	9	12‡
Type IV	1	None	1	None	1	None	None	1	None	1	None
Totals	49	7	13	24	21	1	30	19	14	21	14

* Five patients showed no pannus; diagnosis was based on appearance and family history.
† Trachoma in this patient while improved was not arrested at end of treatment.
‡ Seven of these patients were classified as "flare-up" trachoma; see text.

TABLE 2

SUMMARY OF PATIENTS TREATED *Locally* TOGETHER WITH SULFANILAMIDE

Stage of Trachoma	Number of Cases	Condition of Cornea					Previous Treatment		Results of Treatment		
		Pannus			Scars	Ulcers					
		Slight	Moderate	Heavy			Yes	No	Unchanged	Improved	Arrested
Type I	36	15*	11	1	2	None	9	27	None	8	28
Type IIa	132	12	60	60	55	3	36	96	None	21	111
Type IIb′	13	2	10	1	5	1	2	11	None	3	10†
Type III	91	4	18	69	84	10	77	14	1	5	85‡
Type IV	2	None	1	1	2	1	2	None	None	1	1
Totals	274	33	100	132	148	15	126	148	1	38	235

* Nine of this group did not have pannus; diagnosis was based on appearance and family history.
† Includes patient with ulcer.
‡ Includes patient with ulcer; also eight patients with "flare-up" trachoma.

certain instances grattage and subsequently silver salts; in other instances only metallic salts. The pertinent information on this experiment has been summarized for convenience in table 2.

The results with reinforced treatment were so strikingly different from those in which sulfanilamide alone was used, it is scarcely necessary to make a detailed analysis of the data. The majority of the patients were in the type IIa- and type-III category, and 15 had active corneal ulcers as well as the usual signs and symptoms of trachoma. The patients with ulcer were given whatever palliative and symptomatic treatment was indicated, this varying according to need of the different patients. In the end, it was found that the disease in 235 of the 274 patients was completely arrested, in 38 it was improved, and in 1 instance of extremely recalcitrant trachoma no progressive benefit was received from the combined treatments. Those in whom the condition was arrested included all the individuals with ulcers as well as eight others in whom the disease must be considered as exacerbative. It is of interest to note that in 39 patients (about 12 percent) their trachoma remained uncontrolled not only under sulfanilamide therapy but even under additional treatment usually "curative" in its own right. It is small wonder, then, that one accepts skeptically reports in the literature of wholesale "cures" of trachoma with sulfonamides alone.

It may serve a practical purpose to break down the statistics assembled in table 2 into a division of patients classified as to whether the supplementary treatment consisted of grattage or some chemical agent. The reconstructed data are, therefore, submitted in table 3.

Thus, grattage was employed as a sup-

TABLE 3

COMPARISON OF SULFANILAMIDE TREATMENT SUPPLEMENTED WITH GRATTAGE OR CHEMICAL THERAPY

Stage of Trachoma	Sulfanilamide Supplemented with					
	Grattage: number			Chemical: number		
	Treated	Arrested	Not arrested	Treated	Arrested	Not Arrested
Type I	3	3	None	33	25	8
Type IIa	111	96	15	21	15	6
Type IIb′	None	—	—	13	10	3
Type III	16	16	None	75	69	6
Type IV	None	—	—	2	1	1
Totals	130	115	15	144	120	24

plementary measure in 130 patients distributed among types I, IIa, and III trachoma. The disease in all but 15 patients with type IIa was considered arrested. Additional treatment, consisting of one or another chemical, was used in the case of 144 patients, 24 of whom were still exhibiting active signs of the disease at the end of the treatment, all stages of trachoma being represented among them. This implies, if the figures are indeed of any consequence, a relative failure on the part of chemical means in about 17 percent of cases, as compared with about 11 percent on the part of grattage.

The data on combined therapy, therefore, are particularly gratifying. This is especially true in the case of grattage and sulfanilamide. Thus, what the statistics do not reveal is the rapidity, completeness, and character of the recovery effected by joint action of both treatments. Whereas, of course, it is obvious that grattage arrests the course of trachoma, there have been in the past two unsatisfactory features with regard to the operation: (1) the time required for healing and recovery, from four to six weeks; and (2) the possible tissue damage exemplified by sloughing and variable quantities of scar tissue. When sulfanilamide is used, recovery is usually complete by the end of the drug administration, sloughing and exudate are appreciably diminished, and the end result reveals a conjunctiva that is smooth and glistening with what is considered a minor amount of cicatrization.

The study was continued to include a group of 15 patients whose difficulty was not so much active infection as sequelas of the disease. Each patient was in need of some form of corrective operation. In every instance the lids were more or less completely scarred with only a trace of activity, if any, and the corneas were characterized by multiple scars with different intensities of pannus. While obviously difficult to state whether the discomfort in such instances is due to actual infection or to the irritation caused by the alterations of the lids, it was considered to be of interest to determine the effect of sulfanilamide administered orally as the operation in question was performed. In table 4 will be found a summary of this experiment.

Thus, 12 of the patients were classified as type III, five with moderate, seven with heavy pannus, and only two showing what was considered any degree of clinical activity. On two patients canthoplasty was performed on nine entropion, and on one both procedures were undertaken. Three

TABLE 4

THE USE OF SULFANILAMIDE IN CORRECTIVE OPERATIONS

Stage of Trachoma	Corneal Condition	Number of Patients	Number with Active Disease	Nature of Operation	Final Result
Type III	Pannus, moderate; Scars, multiple	5	None	2 canthoplasty 3 entropion	All satisfactory
Type III	Pannus, heavy; Scars, multiple	7	5 inactive 2 slightly active	6 entropion 1 entropion and canthoplasty	All satisfactory
Type IV	Pannus, heavy; Scars, multiple	3	None	3 entropion	All satisfactory

other patients with type-IV trachoma, but without active disease, were also subjected to operation for entropion. In all 15 patients recovery was complete and the results satisfactory. Obviously, in patients of this kind, operation usually suffices without assistance from other agents. Consequently, it is difficult to feel certain whether sulfanilamide served any distinct purpose in this experiment. It is thought, however, that the drug may be helpful in such instances by its effect in accelerating recovery and on occasion restraining or preventing secondary infection.

One of the most discouraging features in the treatment of trachoma is the frequent recurrence of infection after what appears on the surface to be a genuine cure. Yet in the literature concerning sulfonamide therapy only a rare mention is made of any recurrences following such treatment. This means either the writers believe sulfonamides *cure* rather than *arrest* trachoma or, what is more likely, the different investigators have fallen into the habit of reporting their results as soon as their experiments are finished, thus not allowing sufficient time for the observation of recurrent disease. In order to obtain information on this point, a careful check has been made of the patients treated. It is not intended to imply that the figures to be given are complete or that they possess statistical validity, since considerably more time is necessary to accomplish this purpose. Nevertheless, it is an interesting observation that during the almost three years of study, 5 of the 338 patients thus far under study have returned to the hospital because of recurrent trachoma. This suggests that contrary to popular conception sulfanilamide may not prevent the recurrence of trachoma; or, stated in other words, the drug, like other forms of treatment used in trachoma, *arrests* rather than *cures* trachoma. In this connection, may be recalled the communications by Cooper[6] and Smith, Julianelle, and Gamet,[3] who express similar opinions.

It may be germaine to this account to discuss the toxic reactions encountered during administration of sulfanilamide. During the three years the reactions were severe enough to discontinue treatment in 24 patients who have *not* been considered in the statistics reported above. This means, however, that of a total of 362 patients studied, the drug had to be withdrawn from 6 to 7 percent. Toxic reactions occurred in a number of other patients, also, but not in sufficient intensity to be alarming, so that treatment proceeded uninterruptedly. Thus, selecting 75 patients at random to illustrate the character and variety of these manifestations, cyanosis by itself was observed in 11 individuals, and in different combinations (cephalgia, three times; loss of weight, once; and anorexia, once) 5 times. A morbillous rash was seen twice and in combination (vertigo) once. Rise in temperature occurred in four patients, nausea in three, epistaxis in two, loss of weight in two, vertigo and hallucinations in one, cardiac pain in one, gastritis in one, and jaundice together with nausea in one. It is seen, therefore, that about 50 percent of the patients manifest signs and symptoms of minor intoxication, insufficient to cause cessation of treatment. This figure coincides very closely with that (51 percent) first reported among trachomatous patients by Julianelle, Lane and Whitted.[5]

Discussion

The observations reported in this communication indicate that sulfanilamide alone, administered as described, is apparently unable to arrest the course of trachoma except in only occasional cases. While in the amelioration of corneal manifestations accompanying the exacer-

bative or "flare-up" type the drug attains its highest therapeutic efficiency, its action on follicular or papillary hypertrophy of the conjunctiva is slow and for the most part ineffectual, if one speaks in terms of clinical activity. So also in the case of corneal ulcers uncomplicated by bacterial invasion, its effectiveness must be considered as negligible. The fact, however, that it causes a rapid, initial improvement in such a high percentage of patients suggests, as others have already pointed out, that its greatest value might be as an adjunct to other methods of local treatment. In fact, the data presented here illustrate clearly that when sulfanilamide was supplemented with grattage or local applications of metallic salts, the joint result was an accelerated and striking termination of preëxisting symptoms. This was found particularly true for combined sulfanilamide therapy and grattage, in which the period of hospitalization was shortened two to three weeks or more; the process of healing was cleaner, and the end result was effected with only minimum cicatrization. In this connection, it may be of interest to recall Que's[7] analysis, in which it was shown that preceding the use of sulfanilamide in this institution the average period of hospitalization was 35 days; with combined treatment of sulfanilamide and one of the other accepted methods, the average duration was reduced to 17 days.

The topical introduction of sulfanilamide as drops, either with or without oral administration, appeared to be of little value in the present study. While Cosgrove[8] has reported success with locally applied sulfanilamide alone, Smith, Julianelle, and Gamet,[3] Lian,[9] Guyton,[10] and others were not similarly impressed.

The recent, detailed analysis of the literature, made with considerable care and fairness by Julianelle,[3] removes any necessity for reviewing again the reports covered in his summary. Since then, a number of papers have appeared, some inaccessible because of international conditions, which might be cited to advantage. Thus, Cosgrove[8] and Lijo Pavia[11] have observed the arrest of trachoma in a large series of cases, while Guyton and Woods[12] believed that in a smaller number trachoma had responded to sulfonamide therapy (10 of 11 patients). On the other hand, Que,[7] Lian,[9] Reca,[13] Lavery,[14] Tiscornia, Moret, and Tiscornia,[15] Lugossy,[16] McKelvie, Kirk, and Holden[17] are skeptical of the curative action of the drug, as, indeed, Wilson's results[18] similarly indicate. Luo and Chang[19] confuse their otherwise favorable report by supplementary treatment with zinc sulfate in some patients during sulfanilamide administration; and in all the patients this chemical was applied when the drug was withdrawn.

If, therefore, an appraisal of the treatment is attempted from the literature, the predominant impression is the wide divergence of opinion. It seems odd that after four years' use, there should still be so much contradiction among the different workers. This in itself implies to the writer a certain inability on the part of the drug to accomplish wholesale cures. Similar therapeutic trials in case of bacterial infections—pneumococcal, streptococcal, meningococcal, for example—very quickly led to universal agreement on the therapeutic value of sulfonamides in these conditions. Opposing results after so many trials can only reflect the indifferent capacity of the drugs in trachoma. The indications from this study are that sulfanilamide has a distinct value in the treatment of trachoma, not as a curative, but as an adjunct to other methods.

Summary and Conclusions

1. In experiments for control, patients receiving sulfanilamide by mouth under-

went treatment in one eye with drops of the drug, and in the other with either grattage or application of silver or copper salts; recovery from infection occurred only in the latter eye.

2. Of 49 patients treated with sulfanilamide alone, the condition in 14 was unchanged, in 21 improved, and in 14 arrested, 7 of the cases being of the "flare-up" variety.

3. The drug had least beneficial effect on papillary or follicular hypertrophy of the conjunctiva; its best effect was on the corneal lesion associated with the "flare-up" type.

4. In combined sulfanilamide and other treatment, an analysis of 274 patients reveals arrest in 235 (86 percent), improvement in 38 (14 percent), and no change in one.

5. In the combined therapy, grattage and chemical treatment were of approximately equal effectiveness; their selection should vary in different patients depending upon the character of the disease.

6. In operations performed to correct sequelas of trachoma, it is thought that sulfanilamide may also be of use.

7. The results of this study indicate (a) that sulfanilamide only exceptionally arrests trachoma, and by itself is less reliable than other accepted forms of treatment; (b) in conjunction with other therapeutic measures, recovery is accelerated, and a high degree of efficacy is readily attainable; (c) even in the latter instances recurrences may occur, suggesting that trachoma is, as formerly, *arrested* and not *cured*.

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CILIA IMPLANTATION IN ANTERIOR CHAMBER THROUGH TRAUMATIC CORNEAL PERFORATION*

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According to Würdemann's textbook on "Injuries of the eye,"[1] which is perhaps the most comprehensive work on the subject in English, the occurrence of cilia in the anterior chamber after accidents or operations is rare.[2] Sharpe[3] in 1925 found that 75 such cases had been reported during the last 100 years; perusal of the literature to date, including this report, uncovers 29 more. The actual number of implanted lashes that have been found in injured eyes is listed in the Graefe-Saemisch Handbuch;[4] the individual cilia found in the eye number from 1 to 14.

Cilia as well as other foreign bodies carried through the corneal wound into the anterior chamber rarely remain inert;[5] they usually set up intense inflammatory reactions. Iris reaction to cilia implanted in the anterior chamber may take the form of iridocyclitis with ciliary injection and irritation, photophobia, lacrimation, and snyechiae; iris cysts and epidermoid tumors; giant-cell development about the cilia; subsequent cataract formation, glaucoma, and sometimes terminal blindness and loss of the eye.[6] The cases of sympathetic ophthalmia following such an accident have been reported in the earlier literature by Cuvier and von Graefe.[7] On the other hand, Norris and Landis[8] state that: "lashes may cause hardly any reaction and may be considered as indifferent foreign bodies with neither mechanical nor chemical irritation." This is indeed borne out by the cases reported by Gradle,[9], Hughes,[10] Sharpe,[11] and others.

The majority of cilia implantations were found in cases of injury by metallic or glass foreign bodies, in which the penetrating object did not remain in the eye.[12] Because of the exposed position of the eyelashes, it might be expected that the cilia, when carried into the anterior chamber, would be frequent sources of infection and would set up severe purulent or plastic inflammation. Two cases reported by Hirschberg bear this out for, in both instances, a purulent circumscribed inflammation cleared up after removal of the implanted cilia. On the other hand, "Müller, according to Bulson,[13] reported a case in which cilia remained in the anterior chamber for 24 years without serious result.

Kronfeld[14] states that experimental work has been performed in which defatted cilia, implanted in the anterior chambers of experimental animals, have been retained for long periods of time without inducing any reaction. The implication is that the irritating agent is very likely the oils and fats on the shafts of the cilia.

Cilia, present in the anterior chamber for long periods of time without inducing apparent irritation, may eventually cause inflammatory signs[15] together with plastic iridocyclitis or epithelial tumors and cysts. According to Würdemann,[16] Rothmund in 1871 collected 37 cases of cilia in the anterior chamber associated with epithelial cysts or pearl-tumor formations, due to epithelial proliferation of the root-sheathes of the transplanted eyelash. However, cilia remaining for a considerable period of time in the anterior chamber may undergo bleaching, splitting, or gelatinous encysting.

* Presented before the Chicago Ophthalmological Society, on November 17, 1941.

Würdemann[17] stated that the prognosis is most favorable when the cilia are removed early by corneal incision and forceps extraction. He recommends that the treatment and procedure in each case be individualized to suit the varying circumstances.

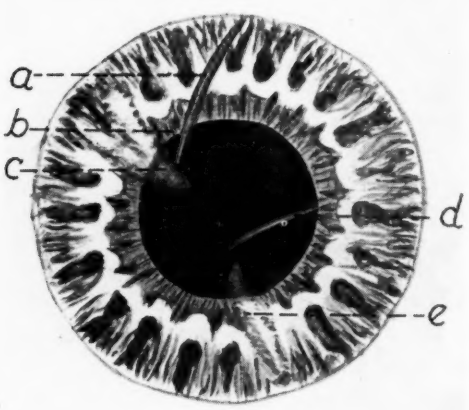

Fig. 1 (Cowen). Position of cilia immediately after the accident, one hanging from the posterior surface of the corneal perforation: a, cilium attached to posterior corneal surface; b, sphincter iridis tear; c, corneal perforation; d, cilium adherent to anterior lens capsule; e, corneal laceration.

Case history. H. S., a white male, aged 55 years, while watching a baseball game from the grandstand on April 29, 1941, ducked to avoid a fly ball and struck the side of his head against the edge of the seat behind him, breaking his glasses and cutting the upper and lower lids of his left eye. There was intense bleeding and immediate blurring of the vision of the left eye. First aid was administered at the ball park, and the patient was examined by the writer about one hour after the accident.

Objective examination. The corrected vision with a +1.75 D. sph. ⊂⊃ +0.25 D. cyl. ax. 100° was 20/20—2 in the right eye, and 20/50—2 in the left (injured) eye with the same correction. The skin of the left lower lid was bleeding through a jagged Y-shaped laceration 28 by 15 mm. in size; there were multiple smaller cuts in the skin of the face and upper-lid margin. The exposed, deep tissues were oozing freely, and there were numerous subcutaneous and subconjunctival hemorrhages. A vertical 10-mm. laceration passed through the inferior tarsus and conjunctiva from the outer wound.

The left eye was tearing slightly but showed no photophobia. In the cornea of this eye were two irregular linear wounds each 1 by 4 mm. long (see figure 1), staining with fluorescein. Under the slitlamp, the upper one of these wounds, adjacent to the limbus at the 10-o'clock position, was observed to be a perforation. From its posterior surface, hung a brown cilium, 5 mm. long, directed towards the upper chamber angle, and casting a shadow on the underlying iris. On the anterior lens surface a second cilium was found, projecting under the pupillary border into the posterior chamber. There was a tear in the sphincter border of the iris at the 10-o'clock position, but no opaci-

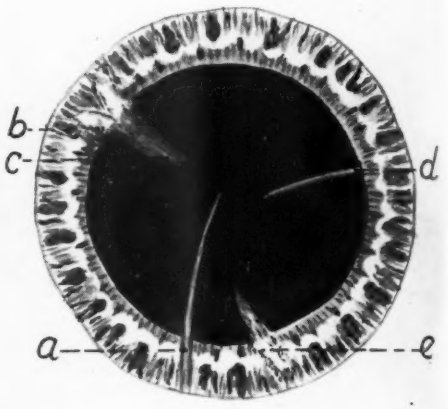

Fig. 2 (Cowen). Subsequent position of cilia after two days, with one now fallen into the inferior chamber angle: a, fallen cilium, previously hanging from the posterior surface of corneal perforation; b, site of sphincter iridis tear; c, corneal perforation; d, cilium adherent to anterior lens capsule; e, corneal laceration.

ties of the lens nor lesions of the capsule could be detected.

Both anterior chambers were formed and of equal depth. The pupils were 2.5 mm. in diameter and reacted promptly to light. Under the biomicroscope, large clumps of pigment were observed on the posterior surface of the left cornea, and a small number of cells in rapid motion in the anterior chamber. There was no evidence of hyphema, and the fundi, seen after dilation of the pupils with adrenalin and cocaine, appeared to be normal.

The skin and conjunctival lacerations were closed with interrupted black silk sutures. Into the left conjunctival sac was instilled 35-percent ophthalmic cod-liver-oil ointment, 1-percent aqueous mercurochrome solution, and 1-percent atropine-sulfate solution. Hospitalization was advised, but the patient requested permission to go home. Examination by the patient's general physician revealed that his general condition was good, although there had been a history of coronary thrombosis six years previously.

On the day following the injury, April 30, 1941, the patient experienced considerable pain in the left eye. Ciliary flush, photophobia, and dilation of the iris vessels were observed, and the upper cilium had dropped from the posterior surface of the wound into the inferior chamber-angle, the shaft leaning against the lens surface. No glass in the cornea or anterior chamber was demonstrated by fluorescence under the Birch-Hirschfeld Uviol lamp. Intramuscular nonshock-producing foreign-protein injections of Omnadin were administered, with the application of occlusive, antiseptic, and emollient dressings locally. The corneal epithelium healed well over the perforation but the symptoms of ciliary irritation became more severe with intense tearing, blepharospasm, and redness of the left bulb. The flare of the beam in the aqueous was definite, and considerable fibrin was thrown out about the cilia.

One week after the injury, on May 7, 1941, the patient was admitted to Michael Reese Hospital and the cilia were removed with considerable difficulty through a limbal incision with the keratome, at the entire infero-temporal quadrant, under a prepared conjunctival flap. The cilia were extracted with toothless forceps with the aid of Dr. Samuel J. Meyer, who had followed the case with me from its inception. The patient was discharged from the hospital four days later, but on the seventh day the pain returned, necessitating his rehospitalization. Shock-producing foreign proteins, which had been withheld because of the past history of coronary thrombosis, were prescribed in the form of typhoid antigen given intravenously, along with inductotherm treatments to the eye twice daily and cycloplegics.

The left eye has subsequently been practically free from ciliary injection and pain-free; there has been no visible beam in the anterior chamber. Several posterior synechiae are present near the areas where the cilia lay and near the point of the iris laceration. Large clumps of brown pigment are still present on the posterior corneal surface, but the left anterior chamber is free of circulating cells. The lens and vitreous have remained clear, and the fundus, somewhat distorted by the corneal opacities, appears to be normal. The peripheral visual fields for white (1 mm.) and red (3 mm.) are normal.

An increase of three diopters of astigmatism against the rule has appeared in the left eye since the injury, a determination of the refractive error three months after the injury revealing this change: R.E.: +1.75 D. sph. ⊂⊃ +0.50 D. cyl. ax. 85° = 20/20; L.E. +1.75 D. sph. ⊂⊃ +2.50 D. cyl. ax. 170° = 20/20—3.

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NOTES, CASES, INSTRUMENTS

A SIMPLE AND SAFE METHOD FOR REMOVING A CATARACT DISLOCATED INTO FLUID VITREOUS

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Boston

Recently I had the following experience while operating for immature posterior cortical cataract in the case of a female patient aged 42 years. At the completion of the usual corneal incision, a large amount of fluid ran out and the eye greatly collapsed. It was evident that the vitreous was almost if not quite completely fluid. After a vertical iridotomy, an attempt by means of a wire hook to remove the cataract caused the latter to become dislocated backward and to disappear from view. On the spur of the moment I instructed my assistant, Dr. Thomas Cavanaugh, to pass an irrigator tip just above the usual position of the lens and direct a stream of normal salt solution into the vitreous chamber. As expected, this filled out the globe and immediately caused the cataract to come forward into contact with the cornea. While my assistant gently continued the irrigation, I inserted the loop and removed the cataract intact without the slightest difficulty. Recovery from the operation was uneventful, and the vision obtained was 20/30 with +7.00 D. sph. ⌯ +4.50 D. cyl. ax. 175.°

So far as I know the procedure described has not previously been employed in such an emergency. Obviously it is superior to the usual one of fishing with a sharp hook for the cataract. The hook may injure the retina, or it may so rupture the lens capsule that this and much lens matter may remain in the eye. On the other hand, there is no reason to fear that irrigation will damage the eye when the vitreous is fluid, provided the stream is not unnecessarily forcible.

The procedure might be effective and the safest even in certain cases of cataract in which the vitreous is normal, and in cases of traumatic posterior dislocation of the lens. This seems to me so probable that I shall cautiously attempt the procedure in my next case of either kind in which the lens remains or recedes far behind the iris after the corneal incision is made.

395 Commonwealth Avenue.

LACRIMAL CANALICULUS DILATOR*†

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New York

Because of the need for rapid dilation of the canaliculi, if one wishes to pass probes up to no. 6 Bowman, two canaliculus dilators have been constructed.

The lacrimal canaliculus dilator shown in figure 1A has a diameter of a no. 1 Bowman probe at the tip and widens to no. 6 Bowman probe at the maximum

Fig. 1 (Berens). Lacrimal punctum and canaliculus dilators: A, canaliculus tip 13 mm. in length and widening in size from a no. 1 to a no. 6 Bowman probe; B, canaliculus tip is 10 mm. in length, and the diameter varies in size from a no. 8 Bowman probe at the base to a no. 1 at the tip.

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* Made by V. Mueller and Company, Chicago, Illinois.

† Aided by a grant from the Ophthalmological Foundation, Inc.

enlargement. The handle is 56 mm. long; the tip to the maximum enlargement measures 13 mm. The neck of the dilator is 7 mm. in length.

Another dilator is available with a shorter tip (fig. 1B) for more rapid and greater dilation of the punctum and canaliculus. The tip is the size of a no. 1 Bowman probe and enlarges to a no. 8 Bowman probe at the base. The canaliculus tip is 10 mm. in length.

35 East Seventieth Street.

A NEW DIAGNOSTIC MOTILITY SCHEME

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According to my experience, the diagnosis of a paresis of the vertical motor is difficult for the general practitioner to make, and even for students in ophthalmology and neurology.

In devising the scheme herewith presented it was taken into consideration that: 1. The physician must be able to make a correct diagnosis without knowing beforehand which eye is paretic. 2. The method by which a clinical case is to be investigated should be clear from a knowledge of the scheme. 3. As the basis of diagnostic work in this field, a thorough knowledge of the anatomy is indispensable.

The scheme is used as follows:

1. Which eye is lower? If, for example, it is found by one of the common methods that the right eye is the lower, four of the eight possibilities are excluded. In the right eye only the elevating muscles can be impaired, whereas they must be normal in the left (higher) eye. The case consequently belongs to the upper main group of the scheme. The position of the eyes is sketched as the physician sees it in studying his patient. The muscles that might be involved are stated above the eyes, the arrow pointing out the normal effect these muscles have on the eye if it is not paretic.

2. Is the separation of the images or the vertical deviation greatest in looking to the right or to the left? If, for example, it is found that the greatest vertical separation occurs in looking to the right, there remain only two possibilities: It will be clear from the anatomic drawings under the diagrams of the eye that this position (looking to the right) is favorable in diagnosing a vertical deviation caused by a paresis of the superior rectus of the right eye or the superior oblique of the left eye. A vertical deviation caused by the two other muscles of this upper main group, the right inferior oblique and the left inferior rectus, will become more evident in looking to the left. In the anatomic drawings the underlying muscles are indicated by a dotted line. If it has been found that a case belongs to the upper main group and that the deviation is more considerable in looking to the right, the next question is:

3. Is the deviation greater when looking to the right and up or to the right and down? If the deviation is greater when the gaze is to the right and up, only the right superior rectus can be involved, since it is an elevator; whereas the left superior oblique is a depressor.

Thus, on the basis of these three characteristics, it seems easy to make a correct diagnosis. It not infrequently occurs, however, that because of a secondary contraction of the antagonistic muscle the difference in looking upwards and downwards is slight. Therefore, in the center of the scheme, a fourth diagnostic feature is presented which is of considerable help in these more complicated cases: If

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[EDITOR'S NOTE: This paper is necessarily published without the author's endorsement of the printed form.]

the head is tilted toward the right shoulder, the eyes rotate to the left, as is indicated in the sketch by the small dotted arrows, just as if they tried to maintain their original position in relation to the outside world. It is shown in the small anatomic drawings that this movement is effected by the action of the superior retic. Consequently, a patient who suffers from a paresis of the left superior oblique muscle tends to tilt his head toward the right shoulder in order to avoid the annoying separation of images (diplopia). This typical position of the head may be of considerable help in cases of long standing with secondary contraction.

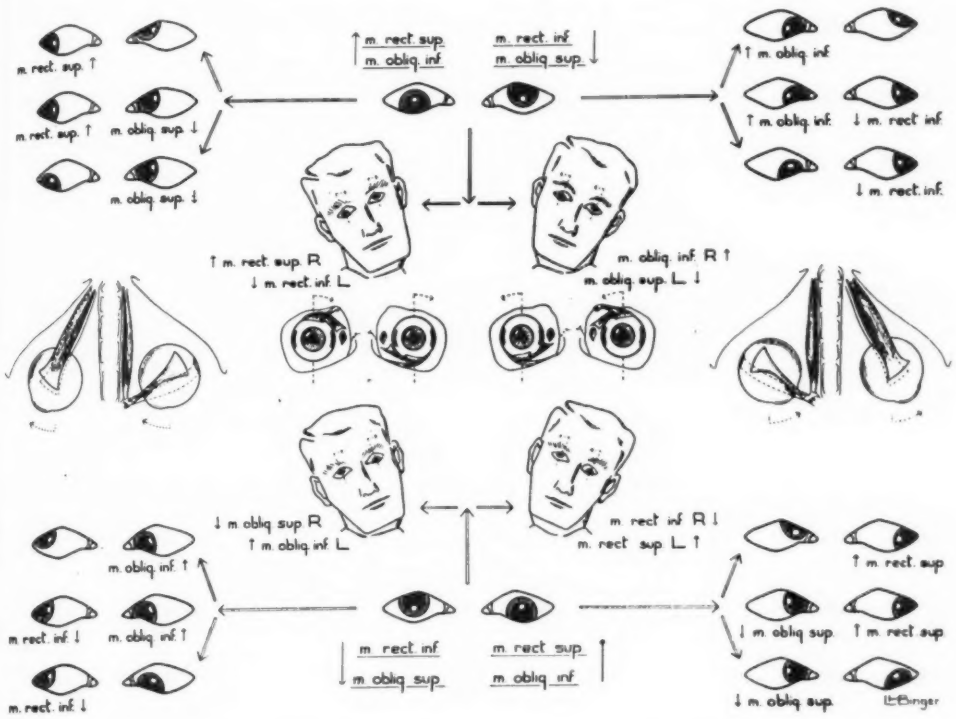

Fig. 1 (Hagedoorn). A new diagnostic motility scheme.

muscles of the right eye and the inferior muscles of the left eye. If, for example, a case belongs to the superior main group (right eye lower), and the deviation increases in looking to the right and down, it may remain obscure whether there is a paresis of the right superior rectus or of the left superior oblique. If the deviation increases in tilting the head toward the right shoulder it must be the right superior rectus, if it increases on tilting the head to the left shoulder it must be the left superior oblique muscle that is pa-

With the help of the scheme a more complicated case may be easily analyzed:

Mr. K. E. complained of diplopia. He had been ill for some weeks but did not know the diagnosis. There was a deviation of the left eye outwards and downwards. The diagnosis of a paresis of the internal rectus of the left eye was easily made. The diagnosis of the cause of the vertical deviation was made according to the scheme: 1. Left eye lower: lower main group. 2. In looking to the left the deviation disappeared. Consequently the paretic

muscle was expected to exhibit symptoms in looking to the right, but this could not be demonstrated since the left internal rectus was paretic. Nevertheless it seemed very probable that either the right inferior rectus or the left inferior oblique muscle was involved. In tilting the head towards the left shoulder the deviation disappeared completely, but increased notably in tilting the head towards the right shoulder. This could occur only if either the right superior oblique or the left inferior oblique were paretic. Had the former muscle been paretic, there would undoubtedly have been an increase in the deviation upon looking to the left. Consequently a diagnosis was made of a paresis of the left inferior oblique. The diagnosis was confirmed by the fact that this combination (internal rectus and inferior oblique) is easily explained by a disturbance in the nuclei of the oculomotor nerve, both nuclei lying close together.

I use the scheme in booklet form, pasted on a cardboard, folded in the middle.

University Eye Hospital.

SOCIETY PROCEEDINGS

EDITED BY DR. RALPH H. MILLER

COLORADO OPHTHALMOLOGICAL SOCIETY

December 21, 1940

DR. WILLIAM M. BANE, *presiding*

GLAUCOMA WITH CHRONIC UVEITIS

DR. WILLIAM H. CRISP presented a man, aged 67 years, whose right eye had developed a remarkable series of disturbances apparently arising from a very sluggish type of chronic uveitis of unknown origin. The patient, a farmer, was in good general health, and his left eye was entirely healthy. He had first appeared for examination in December, 1939. At that time the iris of the right eye, normally blue, had become a reddish brown; the pupil of this eye was immobile and irregular in shape, measuring 3 by 3.5 mm.; the tension was 66 mm. Hg, Schiötz; the corrected vision 5/30 partly. There was no pericorneal injection. There were some nonpigmented cell masses in the lower angle of the anterior chamber. Since the pupil reacted only slightly to various miotics, iridencleisis was performed on January 6, 1940. There was no appreciable postoperative reaction, but it became evident that the teeth of the iris forceps had punctured the upper part of the anterior capsule, and an opacity of the lens developed from this point to involve the whole lens. The tension, under pilocarpine, remained slightly under 50 mm. Hg, Schiötz. Extracapsular extraction was performed on February 6, 1940, the knife being brought out in front of the iridencleisis bleb. In spite of rather exceptional freedom from postoperative congestion, the eye showed practically no tendency to absorption of cortical material. Several needlings were well tolerated but were disappointing as to the amount of absorption induced. However, by May 20, 1940, the tension of the right eye, under pilocarpine, had dropped to 22 mm. Hg, Schiötz, and the vision with a cataract glass was approximately 5/5. The patient insisted on trying to wear the cataract lens together with the proper correction for his sound eye, and appeared to have no difficulty in doing so. The eye went along comfortably until October, 1940, when after a cold it became fairly painful and lost a good deal of vision. When seen again by Dr. Crisp, on October 18, 1940, the eye had recovered vision of nearly 5/7.5 under the use of pilocarpine and eserine. Tension was 52 to 55 mm. Hg, Schiötz. The anterior chamber was half full of large fluffy spherical cell clusters, almost colorless. Measures subsequently employed included paracentesis with partial withdrawal of cell masses. For a while the eye obtained tension of 30 mm. Hg, Schiötz, and was fairly comfortable, but the formation of abundant cell masses remained prominent. This was the condition at the time of exhibiting the patient. All lines of systemic and local investigation as to etiology had proved ineffective, including examination of teeth, respiratory tract, prostate, chest, and blood. (Early in May, 1941, enucleation by the patient's local ophthalmologist became necessary on account of attacks of pain. In the interim, X-ray examination had failed to disclose an intraocular foreign body.)

CONTUSION OF EYEBALL COMPLICATED BY INCREASED TENSION

DR. WILLIAM M. BANE presented the case of K. A., aged nine years, who had been struck in the left eye by a green plum on June 17, 1940. The boy had been seen previously by a physician, who found the ocular tension to be increased, though

there was no decrease in vision. Three days after the accident the vision became cloudy and the eye became painful. On June 22, 1940, the vision of the right eye was 20/15−2. The external and ophthalmoscopic examination of this eye was entirely negative. The vision of the left eye was nil. The tension of the left eye was increased to palpation. The anterior chamber was filled with a black blood clot. On June 23, 1940, the tension of the left eye was found to be 33 mm. Hg, Schiötz. The patient was kept in bed for a week, at the end of which time the tension was found to have increased to 56 mm. Hg, Schiötz. The patient was then hospitalized on June 29, 1940, and a cyclodialysis was performed. The tension has remained normal or below since the operation. The eye has been free of pain, and the anterior surface of the iris and the posterior surface of the cornea have taken on a rust color, suggesting blood pigmentation.

NEUROTROPHIC KERATITIS FOLLOWING A CATARACT EXTRACTION

DR. WILLIAM M. BANE presented the case of N. A., aged 60 years, the report of which was made at a previous meeting.

ALLERGY AND ITS RELATIONSHIP TO DISEASES OF THE EYE

DR. ALBERT LEMOINE, Kansas City, the guest speaker, read a paper on this subject.

Harry W. Shankel,
Secretary

COLORADO OPHTHALMOLOGICAL SOCIETY

January 18, 1941

DR. WILLIAM M. BANE, *presiding*

PHARMACOLOGY OF VITAMINS

DR. RICHARD W. WHITEHEAD, professor of physiology and pharmacology at the University of Colorado School of Medicine, discussed the recent pharmacologic developments and therapeutic applications of the vitamins. He also emphasized the recent developments in this field referable to ocular diseases.

VITAMIN A AND ITS RELATIONSHIP TO OPHTHALMOLOGY

DR. GUY HOPKINS gave a very brief summary of the historical discovery of the association of vitamin-A deficiency and night blindness, following which the work of Yudkin, Jeghers, and Cordes was briefly reviewed. Attention was called to the vast amount of literature on the subject, with many annd varied claims for different conditions, largely unsupported in many instances by scientific data. A brief discussion then followed on the use of the biophotometer. The work of Jeans and Zentine on children was reported, and that of Steffeni, Barr, and Sheard of the Mayo Clinic, on adults. This was followed by a brief review of the therapy of vitamin A, the needs of the average child and adult being mentioned, based on the giving of a certain number of standard units, either in the form of foods containing vitamin A, or supplemented by some form of vitamin-A preparation.

VITAMIN-B COMPLEX AND ITS RELATIONSHIP TO OPHTHALMOLOGY

DR. GEORGE A. FILMER said that up to the present time, at least 12 separate factors have been identified or isolated from the vitamin-B complex. Most of these have not as yet proved to be important for humans, so were not discussed. Vitamin B_1 (thiamin) has not been further subdivided; its importance in ophthalmology is in the treatment of toxic amblyopia. Carroll has shown that it is the vitamin deficiency and not the toxic element that primarily is responsible for the

diseased condition. Its use in optic neuritis is advised, but has not proved conclusively effective. The old vitamin B_2 has been further subdivided many times. The factor whose deficiency results in corneal vascularization and unhealthy conditon of the conjunctiva and lids has been found to be riboflavin. The use of this factor in rosacea keratitis has in many cases produced dramatically good results. The other factor having possibilities of value in eye disorders is pantothenic acid. Its lack or deficiency in rats has produced corneal ulcers, although its action in humans has as yet not been definitely decided.

Harry W. Shankel,
Secretary.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

January 19, 1942

Dr. J. J. Frey, *Chairman*

Ocular manifestations of multiple melanosarcoma

Dr. R. C. Smith presented the case of B. H., aged 25 years, who was seen on September 19, 1941. In January, 1941, five months after undergoing an appendectomy, he had discovered a bluish spot beneath the skin adjacent to the abdominal scar. Within a few weeks similar spots had appeared on his face. A biopsy of the abdominal lesion was performed, and the specimen was reported benign by the Department of Pathology of the Massachusetts General Hospital. In April, 1941, the left testicle became enlarged, and was immediately removed at Vanderbilt Hospital. The Department of Pathology there reported a malignant melanotic growth.

Other changes developed rapidly. Hematoporphyrinuria and increasing skin lesions came first. Then the entire body took on a bluish color. The patient attributed this to sunburn; however, it was present, although not so deep, over the surfaces covered by his swimming trunks. Three weeks before he was seen by Dr. Smith he had noticed black spots before the right eye. These had increased in size.

"Fever therapy" and X-ray treatment of the pituitary and suprarenals had been employed. The patient was very asthenic. Within 10 days after his first visit he died. Ocular examination: Visual acuity was 20/200 in the right eye and 20/100 in the left. There were slatelike splotches over the skin of the eyelids and in the palpebral and bulbar conjunctivas. The pupils were irregularly dilated. There were large confluent brownish pigmented elevations in both irides, the larger one being in the left eye. In the right eye there was a large, black, solid detachment of the retina extending from the disc downward. In the fundus of the left eye black areas of subretinal pigment were observed scattered everywhere. One of these was adjacent to the nasal margin of the optic nerve, and the pigment extended on to the surface of the nerve head.

Since death occurred at his home in a small South Carolina town, no autopsy was performed.

W. W. Wilkerson, Jr.,
Secretary.

SAINT LOUIS OPHTHALMIC SOCIETY

January 24, 1941

Dr. J. F. Hardesty, *presiding*

Formalized heterogeneous and homogeneous corneal transplantations —experimental

Dr. Harry Rosenbaum presented a paper on this subject which appeared in

the December, 1941, issue of the Journal.

Discussion. Dr. B. Y. Alvis said keratoplasty presented many as yet unanswered questions. These questions can be answered and the fundamental principles of pathology and biology, and the points of surgical technique by which success can be attained in this procedure, can be established only by prolonged and painstaking researches such as that performed by Dr. Rosenbaum, with the results applied clinically in a large number of cases.

There are many unanswered questions. One of the most important problems is: Which corneas are suitable subjects for operation as far as prognosis is concerned?

Much has been learned regarding this problem from the experience of Filatov, Castroviejo, Thomas, Elschnig, and others who have shown that the graft must be in contact with some clear cornea if it is to remain clear; that total opacity of the host cornea with vascularity almost precludes the possibility of success; that increased intraocular pressure, aphakia, anterior synechias, and many other conditions are adverse to securing permanently clear implants.

The problem of securing suitable material is one of the major issues. Apparently fresh, healthy homogenous transplants are superior to all others, according to cases reported. However, Filatov, as well as some others, has reported equally good or even better success with tissue preserved by cold, for hours and even days, so the question of the suitability of preserved tissue remains open and can be answered only by continuing such researches as this for long periods. Progress is painfully slow. These operations require much time, considerable material, and most exacting technique.

Dr. Alvis said that in an original series of experiments with the corneal punch, where only fresh homogenous transplants and even autotransplants were used, the percentage of completely successful results was most disappointingly low. It would certainly be a most valuable contribution and would do much to make this operation available to surgeons outside the large clinical centers, if some method of successfully employing preserved tissue could be worked out. As a further contribution, extensive researches of this kind could help to establish the simplest and surest operative technique. The question of the efficacy of the punch as against the trephine or the twin-knife–scissors method of Castroviejo is still not finally answered.

The method of retaining the graft needs to be simplified. The use of sutures, such as those used in the research, so far seems to be superior to the use of conjunctival flaps or foreign membranes, but the sutures are difficult to place, hence are not an entirely safe procedure except in the hands of those who have done the operation repeatedly on experimental animals. The cutting of the sutures after the recipient cornea is opened would be little less than disastrous. In this event it would be practically impossible to place them in the cornea of such an eye. For this reason Dr. Alvis believed such research as that reported by Dr. Rosenbaum must be considered a valuable contribution, even though the results were negative so far as securing transparent implants was concerned.

Dr. W. M. James said it was interesting to note that the treatment of corneal opacities has been attempted from the earliest medical times. Approximately two centuries ago corneal scars were "pared off." One physician recommended scrubbing the opacity as often as every three months with a barley bristle brush. The replacement of opaque corneal tissue by corneal-tissue transplantation was undertaken in 1818 by Reissinger. Various substances

have been used to replace corneal tissue, even a glass button. According to Castroviejo, eyes favorable for keratoplasty (1) must be of normal tension, (2) the diseased tissue must be confined to the cornea, (3) the leukoma should not be very dense, and (4) areas of clear cornea should surround the graft.

Dr. Theodore Sanders said he had had the privilege of examining these sections microscopically. There seemed to be two chief points of histologic interest; first, the source of the tissues in the final repair, and, second, the nature of the opacity. Unlike other corneal transplants, it is certain that all the living elements come from the host. This is obvious in the case of epithelium and endothelium. Descement's membrane, because of the rolling of its cut edges in the graft, appears to be formed from the Descemet's membrane of the graft. This apparent revitalization of a dead tissue is against all biologic rules. The most difficult question is the fate of the corneal lamellas of the graft. It is impossible to tell whether they are absorbed or replaced by an ingrowth of lamellas from the host or whether there is a cellular infiltration with new lamellas formed with the dead fibers of the graft as framework. At first the opacity is probably the result of swelling due to absorption of aqueous. Later this may be due to actual scar or to an optical effect from irregularity of the lamellas. Surprisingly little scarring is noted in these sections. When we remember that a dead formalinized graft was used, the regular histologic repair is amazing.

Dr. Rosenbaum, in closing, said that Dr. Sanders had brought up the cause for corneal opacities. In the slides shown it is almost impossible to differentiate between the grafted area and the normal cornea. Dr. Tudor Thomas transplanted sclera in rabbits' eyes and reported that in one to two years the transplants became translucent. From examining these grafts under the microscope, Dr. Rosenbaum came to the same conclusion as had Dr. Sanders, Dr. James, and Dr. Lamb. Dr. Lamb was more enthusiastic about the microscopic appearance than he was about the gross appearance. One of the chief reasons that the grafts do not become clear seems to be that Descemet's membrane keeps it from becoming transparent. Descemet's membrane is curled up at the ends and is usually enveloped in the middle of substantia propria.

Two investigators in New York, Karl Meyer and Eleanor Chaffee, have found that a certain mucopolysaccharide was present in clear corneas in greater amounts than in cloudy corneas. Dr. Lamb said he had yet to see one case that was suitable for a corneal transplant. He could not account for the intraocular changes because he had not followed the animals for a long enough period of time.

Autofundoscopy

Dr. Leslie Drews presented a communication on this subject which appeared in the December, 1941, issue of this Journal.

Discussion. Dr. F. Luedde said he believed more attention should be paid to autofundoscopy and that he himself felt that he had missed much by not following it up. Dr. Drews has come a step further by putting it into practice.

Dr. J. F. Hardesty said Dr. Drews had shown him things in his own eyegrounds he had never seen before.

Dr. W. M. James asked if Dr. Drews had any information on amblyopia ex anopsia.

Dr. L. Drews, in closing, said no attempt has been made to describe all the conditions in which autofundoscopy combined with afterimages of known size might be used. The patient could project

his own fundus onto a screen, but this technique is not clinically usable. The filaments can be moved so that the afterimages are nearly the same size as the lesion. In cases of false macula the use of this technique would be of great interest.

In the cases of amblyopia ex anopsia which he had tested, the fovea was represented by a dark spot if the amblyopia was of high degree. He was reasonably certain that this technique might fail to reveal abnormality in cases of retinal detachment. As to the question whether the afterimages are imprinted upon the retina or upon the cerebral center, Duke-Elder believes that the images are retinal. Dr. Drews believed that one might suppose that his results would indicate possibly a cerebral localization of the afterimage, at first glance, but these experiments have given no conclusive evidence as to this question.

Adolph C. Lange,
Editor.

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THE EXTRAOCULAR MUSCLES

The extraocular muscles differ so radically in their anatomy and physiology from other muscles of the body, that their defects, pathology, and operative treatment can be understood only when these differences are properly appreciated and kept in mind. The biceps, with a wider origin, has practically a single point of insertion. The flexors and extensors of the fingers have each the single function indicated by their names. The recti muscles of the eye have practically a point of origin, from which they spread out to fanlike insertions. The external rectus, as a whole, turns the eye out; the internal rectus turns it in. But the superior fibers of the external rectus tend to turn the eye up, and the inferior fibers to turn it down. The same is true of the internal rectus.

The superior and inferior recti, with their spreading insertions, have similarly opposite influences in the lateral rotation of the eyeball: the internal fibers help to turn the eye in, or to keep it turned in; the external fibers of both muscles tend to turn it out, or to keep it turned out. The opposing actions of different fibers of the same muscle may help greatly in the exactness and steadiness of the different movements of the eye. The facts and implications of such an arrangement should be borne in mind, in the planning

of any operative procedures involving the extraocular muscles.

A complete and carefully executed tenotomy of the internal rectus may be a failure because the eye is still held in the convergent position by the contracted inner (or medial) fibers of the superior rectus and inferior rectus. For a similar reason, a good tenotomy on the external rectus may leave the eye still turned out because the lateral fibers of the superior and inferior recti hold the eye in a divergent position. Vertical strabismus may still continue after careful operations have been performed on the superior or the inferior rectus, because the influence of the oblique muscles on the vertical movements of the eyes was not considered.

This aspect of deviations from the normal eye movements has been discussed before, but has failed to receive proper attention because the anatomic arrangement of the eye-muscle insertions, and its difference from the insertion of other muscles, are still often overlooked. As the eyes turn in, or turn out, the lateral recti muscles that are contracting become less powerful with the departure of the eye from its position looking forward. But the shortening of the external fibers of the superior and inferior recti rather gains through their influence on the ocular movement. They are not so much shortened, but the insertion is placed in a position where these shortening fibers have a greater influence.

It is certain that attention to the influence of the fan-shaped insertions of the recti will contribute much to the exactness and permanence of the results obtained by operations on the ocular muscles. The spread of the recti tendons to their insertion in the eyeball varies somewhat in different cases. But it always has sufficient influence to be carefully considered in the planning of any operation for squint. An understanding of the influence of anomalies of refraction and accommodation has greatly diminished the number of cases of strabismus, by prevention. But when the deviation of an eye is once established, the whole series of changes brought about by such deviation must be considered, in any attempt to correct it.

Prevention is better than cure, because the coördinations of movements with the visual fields can be perfected only in childhood. Poor vision in early life cannot be made entirely perfect in later years.

Edward Jackson.

MAKING OPTOMETRY A PROFESSION

A good many ophthalmologists find it difficult to keep calm in discussing the "optometry problem." The reasons for this are mainly economic, but professional pride also plays a part.

Public statements by ophthalmologists concerning optometry revolve around the welfare of the community. It is urged that most optometrists are inadequately qualified to diagnose and correct refractive errors, and that the optometrist's ignorance concerning serious ocular disease exposes the customer or patient to the danger that an important malady such as iritis or glaucoma may be overlooked and may fail to receive attention which is urgently needed. It may be argued that the better educated the optometrist the less likely he is to expose his customer to the risk of inadequate care for a serious condition. There appear, however, to be some ophthalmologists who believe that the more an optometrist learns about the eye the more dangerous he becomes to the person who consults him.

On the other hand, there are some intransigent optometrists who urge that everything to do with refraction should be turned over to the optometrist instead

of to the ophthalmologist. One venomous, but we hope scarcely typical, gentleman is quoted as saying: "The optometrists do not fear the competition of the ophthalmologist, incompetent in refraction, any more than the capable lawyers fear the shysters in their profession. We should demand that wherever an eye service is to be performed, especially in the field of refraction, an optometrist must be used, no exception."

Such enthusiastic advocates of the optometric cause need to keep in mind the fact that only three recognized universities, Columbia, Ohio, and California, offer anything like scientific training of optometrists; and that in the state of New York, whose educational standards are hardly open to question, the only persons eligible for licensure are the optometric graduates of these three universities. In most parts of the United States the training of optometrists is only a little less chaotic than it was twenty-five or thirty years ago.

The present writer is convinced that there is in the United States a small but significant minority of optometrists who do good work in refraction, and that more of them would be likely to do good work if they could divorce themselves from unsatisfactory commercial conditions.

An attempt to improve optometric education and ethics is apparently being made by a group of New York optometrists who have recently formed the "Association of University Optometrists," incorporated under the laws of their state. The membership of this organization is confined to optometrists who are graduates of accredited university schools. Among the objectives and purposes of the new organization are the following: "promotion of high standards of optometric education"; "development of professional office practice in optometry"; "discouraging the use of weird instruments of little or no scientific value which are designed to impress practitioners and patients and result in substantial expenditures by practitioners and increased cost to patients"; "fostering harmonious and coöperative relations between optometrists and ophthalmologists." Membership of the organization is divided into two classes: "members who conduct an exclusively professional office practice of optometry" and "associate members who are engaged in the practice of optometry in other than professional offices."

The executive director of the new Association, Harry L. Liss, has issued a pamphlet in which he discusses the whole optometry problem with breadth and insight. He has assembled a number of significant quotations from the public press and from medical and optometric journals.

From an article in Fortune comes the remark that ". . . the distribution of eyeglasses to the ultimate consumer is an incredibly mixed-up business—part profession, part merchandising, with some of the highest and lowest characteristics of each."

Liss divides optometrists in general into three classes: those who combine optometry with another business; those for whom eye examinations are incidental to the conduct of a general optical business; and those who practice on a professional level. He expresses the opinion that the university-trained optometrists in the third division can unquestionably give competent eye care.

Various ophthalmologists have emphasized the parallelism betwen the growth of dentistry as a profession separate from medicine, and the somewhat although by no means entirely similar development apparently going on with regard to optometry. (For example, Lancaster before the Section on Ophthalmology of the American Medical Association, in 1928; and the present writer, Ophthalmic Record, 1913, volume 10, page 3.) In each case the pub-

lic interest has been at stake, and in each case, despite differences of opinion, public interest did or will prevail.

The most formidable obstacle which professional and university-trained optometrists have to face is the necessity of competing with the first two classes mentioned by Liss, namely those who combine optometry with another business, and those for whom eye examinations are incidental to the conduct of a general optical business.

From the report of the Committee on the Costs of Medical Care, Liss quotes the following: ". . . the existence of optometry on its present basis is due to the failure of the medical profession to recognize the importance of this field and its failure to provide needed services. The training received by medical students does not qualify them to do refraction. . . . Furthermore, until recently, adequate postgraduate facilities for the study of ophthalmology have been lacking."

Most ophthalmologists regard the following criticism by the same Committee as reflecting a particularly shallow point of view: "Once it is determined that the patient's eye is normal, except for a refractive error needing correction, then the measurement of that refractive error and the prescription of the proper lens is a function, the performance of which . . . requires no broad medical knowledge. This being the case, the ophthalmologist who spends his time in doing refractions is doing work for which he is overtrained. While so engaged, his general medical knowledge lies idle; it constitutes an unused overhead for which the patient must pay." Surely the same sort of comment might be applied to many individual procedures in the practice of medicine. Most of the "general medical knowledge" of every physician lies idle most of the time: it is simply "ready to serve." The writer of the Committee report apparently conceived the measurement of refraction as a purely mechanical act, unrelated to general human physiology and pathology.

Among damaging confessions from within the profession of ophthalmology, Liss quotes the following by Dr. Linn Emerson: "More than half of most oculists' practice consists of refraction work, which is tiresome drudgery, and many look forward to the time when this work can be turned over to an assistant, with the result that often the quality of the work turned out is in inverse proportion to the eminence of the chief."

Very naturally, acceptance by the ophthalmologist of optical rebates is represented in Liss's pamphlet by several severely critical quotations and comments. One of the numerous pen-and-ink cartoons contained in the pamphlet shows the optician accepting payment from the patient and passing it over, behind the patient's back, to the physician. We are reminded that an article in the Reader's Digest several years ago summed up this matter as follows: "The fee-splitting oculist has no right to decry the optometrists' commercialism. The public has a quarrel with both."

When the subject of optometry is discussed by local or national ophthalmological organizations, one outstanding charge directed at the optometrists is that of commercialism. Yet it is probably true that on most such occasions one half or more of those present are guilty of the commercialism involved in the acceptance of secret rebates from optical houses.

In relation to the attempt to make optometrists professional, several significant questions arise: 1. If the optometrist is to be a graduate of a university and is to conduct his activities upon an entirely professional basis, will his work represent the sort of financial saving to the public which is demanded by the Committee on the Costs of Medical Care? 2. Will the professional optometrist charge professional fees, and if so will he also

profit (secretly, so far as the patient is concerned) from the lucrative margin between wholesale and retail prices? 3. Will it be possible to avoid the less professional competition of the jeweler who advertises on the radio and of the commercial optician who runs an optical shop and also undertakes some refractive work? Or should the old type of refracting optician be forced out of business?

The present writer is rash enough to suggest that, with all its faults and hazards, the peculiarly chaotic evolution of refractive work which is going on in our American communities has some compensations. It may be that the activities of the optometrist have tended to stimulate better refraction work among ophthalmologists; and on the other hand that the need to compete with the ophthalmologist is doing a little to advance the educational standards of the optometrist.

Each group needs to trim its lamps. It is doubtful whether the individual to whom refraction work is "tiresome drudgery" ought ever to have taken up the specialty of ophthalmology. It is certain that the optometrist who is trying to glorify himself and fill his pocket by giving eye exercises and assuming a pseudomedical omniscience is a sore on the body politic. If optometry is to attain the status of a profession it must develop ethical and educational standards such as are advocated by the Association of University Optometrists. But, particularly as regards refraction, there is also room for further improvement in the standards of ophthalmology.

W. H. Crisp.

INTERNATIONAL GRADUATE-STUDENT EXCHANGE

The announcement by the Pan-American Congress of Ophthalmology that it has been authorized by the president of the W. K. Kellogg Foundation of Battle Creek, Michigan, to proceed with the development of the plan to bring 25 Latin-Americans to the United States for graduate training in ophthalmology is received with great pleasure. The plan is to work somewhat as follows: 25 Latin-American physicians are to be selected from the various Latin-American countries by local committees in each country. This committee will be composed of the dean of the medical school, professor of ophthalmology, and a member of the American Legation. The selection of the candidate is to be based upon his academic training and standing, the desire and aptitude to practice and teach ophthalmology on his return to his own country, and his working knowledge of the English language. There are other minor qualifications. Each successful candidate is to be assigned to one of the outstanding ophthalmic institutions of this country for at least one full year or more if he presents particular ability. In the clinic he will serve as an accessory resident and will be trained along with the rest of the members of the department, and subject to the same discipline. Our Department of State and the country of origin of the physician will pay the traveling expenses of the physician. The W. K. Kellogg Foundation will finance each physician to the extent of $1,000.00 annually. This, briefly, is the plan afoot, and the details will require further elaboration, so that it is hardly to be expected that the first Latin-American resident will make his appearance before 12 months have gone by.

Much has been heard recently of the promotion of closer relationship between the two American continents. In the past some of the ideas used in promoting this scheme have occasionally been fantastic, some in poor taste, but others of real value. Undoubtedly there has been a patronizing air about many of the schemes emanating from the North American con-

tinent to our neighbors in the South. Here at last, however, is something real and tangible that we can offer them with open heart and in good faith.

Hitherto, the South American physician, if he could afford it, has been trained in the European clinics, with the result that there has developed a very high standard of ophthalmology in many places in South America. The War and its aftermath have cut with a deadly hand the opportunity for such foreign training both now and for some time to come.

The importance of the American centers of ophthalmic training has increased in the last 15 years, so that it can now be said with the utmost confidence that even had the War not occurred foreign training in ophthalmology was no longer needed.

The influx of South American physicians to our prominent clinics and centers of ophthalmic training will not only stimulate the teaching of ophthalmology in that each institution will take the utmost pains to put its best foot forward but it should also give the welcome guest an opportunity to gain diversified ideas—some of them bad, some of them undoubtedly excellent. It should not be looked upon as a cultural attempt on the part of one nation to impose what it thinks to be a superior knowledge on another but rather along the line of the good will and exchange of knowledge promoted many years ago by the Rhodes scholarship committee. It is unnecessary to describe how well this latter plan has worked in the past for the mutual benefit of the English universities and the American students, not to mention the increased respect between the two countries fostered by the plan. The same good fruits should come as the result of the Kellogg Foundation scholarships.

It would be well to emphasize the fact that the resident will carry back to his own country not only the teaching but, what is perhaps more important, the atmosphere of the chosen clinic. Upon his return the training of the scholar will be compared by his colleagues with that received both in Europe and locally. The marked influence upon the future training program of ophthalmology in his own country will also be reflected by the candidate's training. Last but not least, the reception, friendliness, and the informal atmosphere of learning that is such an important part of American institutions will have a definite influence either for the better or for the worse upon the much-desired Pan-American unity. Therefore, not only will the influence of the Chief of the Department be exceedingly great but this influence will extend down to the utmost depths of his department and even spread like the ripples of a wave.

In addition, the scholar will be required to attend at least one, and perhaps two, of the national ophthalmologic society meetings each year. In this way contacts with other ophthalmologists will be made. The scholars themselves, undoubtedly, will get together and compare their training. It is hard to see how anything but the utmost good can come from such a plan. It deserves the whole-hearted support of all. Derrick Vail.

BOOK NOTICES

PROFILAXIS Y PREVENCION DE LAS LESIONES TRAUMATICAS OCULARES (Prophylaxis and prevention of traumatic ocular lesions). By Atilio Tiscornia, Extraordinary Professor of Clinical Ophthalmology in the Medical Faculty of Buenos Aires, and Juan M. Vila Ortiz, Associate Professor of Clinical Ophthalmology in the Medical Faculty of Rosario. Paper covers, 88 pages, many illustrations of cartoons for the publicizing of prophy-

laxis. Printed privately, price not stated.

This monograph is particularly interesting on account of its many reproductions of prophylactic cartoons from European and American countries. The subject is considered under the following headings: prevention; protective apparatus; eye examination prior to employment; proper illumination and other hygienic measures in the workshop; prophylactic cartoons; education of the workman; education of the general public, school children, and others; creation of private or public institutions for study and diffusion of preventive measures; periodical inspection of working materials; use of protective appliances on machines; facilities for medical consultation in workshops and factories; ocular prophylaxis on public highways; eye accidents in the home; eye accidents in sport.

W. H. Crisp.

DIRECTORY OF MEDICAL SPECIALISTS. Compiled by the Advisory Board for Medical Specialties. Clothbound, 2,500 pages. Columbia University Press, 1942. Price $7.00.

The 1942 edition of the "Directory of medical specialists" is a much larger and even better volume than the 1939 edition. Instead of 14,000 diplomates, the new edition lists 18,000. Three new certifying boards have been established in the interim, covering the fields of anesthesiology, neurologic surgery, and plastic surgery. Obviously, the personnel of the older boards has undergone changes.

The greatest fault of the first edition—namely, the failure to list both the specialty and the state at the tops of the pages—has been corrected. This will add greatly to the speed with which names can be found. A further improvement would be thumb-nail cut-outs for indices, as provided in many large dictionaries.

This new volume contains more than 2,500 printed pages. As it continues to enlarge, probably two volumes will be needed, for the book is already unwieldy because of its size.

It is a fine volume to have in one's possession. The number of times that reference is made to it in the course of the year is astonishing.

Lawrence T. Post.

MANUAL ON THE USE OF THE STANDARD CLASSIFICATION OF THE CAUSES OF BLINDNESS. Prepared for the Committee on Statistics of the Blind by C. Edith Kerby, December, 1940. Published by the American Foundation for the Blind, Inc., and the National Society for the Prevention of Blindness, Inc., for the Committee on Statistics of the Blind, New York.

This paperbound manual of 26 pages is designed as a guide for those interested in compiling statistics on the causes and numbers of cases of blindness. The difficulty encountered in such studies lies in the variations in interpretation that affect the comparability of data compiled by different persons. The guide as issued admirably and within human limits satisfactorily answers the problem. Another use for the manual, and one that those responsible for its appearance may not have anticipated, is to be found in the index of diagnostic terms indicating etiology.

The practicing ophthalmologist can use the code numbers as outlined as a cross index of his own cases. In addition they will be found useful as filing guides to his collected reprints and abstracts from the literature. The short manual represents an important and comprehensive piece of work well done.

Derrick Vail.

A NEW CLASSIFICATION OF THE MOTOR ANOMALIES OF THE EYE BASED UPON PHYSIOLOGICAL PRINCIPLES, TOGETHER WITH THEIR SYMPTOMS, DIAGNOSIS, AND TREATMENT. By Alexander Duane. (Lithographic reproduction of a brochure published in 1897.) Paperbound, 99 pages (including index). Reprint from the Annals of Ophthalmology and Otology, 1896, and the Annals of Ophthalmology, 1897. Copies may be obtained from Dr. James W. White, 15 Park Avenue, New York.

The former associate and leading disciple of Alexander Duane, Dr. James W. White, has reissued, as a token of loving memory, this prize essay that first appeared in the Annals of Ophthalmology in October, 1896, and in January, 1897. The original printed edition was very limited and the publishers retired from business soon after its appearance.

Ophthalmologists will welcome the lithographic copy of the original not only because, as Dr. White states in his foreword, "for the student in extra-ocular muscles there is nothing more practical and no system more workable" but also because of its historical importance as a classic milestone in the study of the extraocular muscles. It is apparently a reproduction of the master's own working copy, since it contains his own marginal notes and corrections in ink. Most of the teaching and writing of Alexander Duane will be found in the essay "more fully and logically than elsewhere." Dr. White has performed a genuine service to ophthalmology in making it available.

Derrick Vail.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1

GENERAL METHODS OF DIAGNOSIS

Allende, F. P. **Study of light perception and projection with a narrow beam of light.** Arch. of Ophth, 1942, v. 27, Jan., pp. 164-166.

In order to investigate the light projection of eyes with cataracts, an ordinary ophthalmic lamp is fitted with a covering in which there is an opening 2 or 3 mm. in diameter. Over this is fixed a slot into which colored-glass filters can be slipped to test color perception. A concave mirror is used at 36 cm. from the eye to project a small beam of light into the various quadrants. J. Hewitt Judd.

Alvaro, M. E., and Silva, M. A. **A simplified technique of gonioscopy.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 406-408. (3 figures, references.)

Bab, Werner. **Psychologic problems in ophthalmologic diagnosis.** Amer. Jour. Ophth., 1942, v. 25, March, pp. 321-329. (5 case reports.)

Carson, L. D. **Visual acuity and speed of recognition.** United States Naval Med. Bull., 1942, v. 40, Jan., pp. 183-186.

The author describes a machine by which the visual acuity is taken with a timed exposure for each letter. After testing the speed of vision of 617 naval aviation pilots by this technique, he concludes that there is a definite relationship between findings of visual acuity using Snellen's charts and speed of visual recognition, and that not every person able to read 20/20 is capable of average speed of recognition. It was also found that some individuals with imperfect visual acuity were still capable of a high speed of recognition. Carson believes that an abnormally delayed speed of visual recognition is due to generally delayed reaction time, strong inhibitory psychic influences, imperfect retinal reception, or high latent refractive errors. He thinks that the above-described technique has certain advantages over standard vision charts. T. E. Sanders.

Friedman, Benjamin. **A simple inexpensive lamp for fluorescence.** Arch. of Ophth., 1942, v. 27, Feb., pp. 372-373.

A 25-watt mazda blue bulb was substituted for the small light included in the commercial unit. This emits, through a purple filter, rays 85 percent of which are of a wave-length of 3,650 millimicrons. The lamp is portable and inexpensive. J. Hewitt Judd.

Harman, Bishop. **Shamming night-blindness.** Brit. Med. Jour., 1941, Nov. 22, p. 737.

By varying the intensity of light and the size of the discs in the test board, the author uses the disc-spotting test to distinguish between a real defect of night vision and a suspected shamming. (See also Brit. Med. Jour., 1941, Sept., p. 349.) F. M. Crage.

2

THERAPEUTICS AND OPERATIONS

Allen, T. D. **Management of ophthalmological surgical complications.** Surg., Gyn., and Obstet., 1942, v. 74, Feb. 16, pp. 598-603.

Allen stresses that if at all possible, we should avoid surgery in advanced age, and in the presence of malignancy, great physical depression, or infection elsewhere in the body, especially around the teeth. He believes that the time to begin handling surgical complications is before surgery is attempted, and reports a case in which surgery was complicated by iridocyclitis of dental origin, the outcome being disastrous sympathetic ophthalmia in the fellow eye.

Considerable space is given to discussion of the prevention and treatment of iris prolapse, and it is pointed out that since the advent of the sclero-conjunctival suture prolapse is much less common. Small prolapses are treated by cautery, larger ones by surgery. The author discusses loss of vitreous before removal of the lens, and advises several small transfusions in cases of recurrent and intractable postoperative intraocular hemorrhage.

Because of the almost inevitable drawing up of the pupil in cases of loss of vitreous, the author makes a meridional cut in the lower part of the iris.

For postoperative glaucoma Allen uses goniotomy or cyclodialysis; in the latter he injects air into the anterior chamber at the time of the surgery.

It is mentioned that delirium is frequently due to the use of barbiturates. Pushing of fluids in elderly people is advised. As prophylactic measures the author makes conjunctival cultures and tests the patency of the lacrimal passages. Eye surgery is not usually an emergency and deserves careful and long preoperative study and examination. Ralph W. Danielson.

Başar, Irfan. **X-ray treatment of ocular diseases.** Türk Oft. Gazetesi, 1940, v. 3, pts. 7-8, p. 349. (French abstract, p. 399.)

The author reports successful use of X-ray therapy in cases of interstitial keratitis, iridocyclitis, vitreous hemorrhage, and thrombosis of a retinal vein. George A. Filmer.

Berens, Conrad. **Refinements of general surgical technique as applied to ophthalmic operations.** Surg., Gyn., and Obstet., 1942, v. 74, Feb. 16, pp. 616-627.

The author points out that ophthalmic surgery consists largely of procedures which are adaptations or refinements of general surgical technique. Special attention is given to the

latest ideas in anesthesia, akinesia, incisions, sutures and suturing, sterilization of instruments and drugs, muscles, plastic operations, glaucoma, alcohol injections, injections for pain in herpes zoster, sclerosing injections for angiomas, electrosurgery, exenteration, detachment of the retina, and electrolysis. The article is recommended for reading in full. (10 figures, 80 references.)

Ralph W. Danielson.

Berens, Conrad. **Sclerotomy scissors.** Amer. Jour. Ophth., 1942, v. 25, March, p. 324.

Chinn, H., and Bellows, J. G. **Corneal penetration of sulfanilamide and some of its derivatives.** Arch. of Ophth., 1942, v. 27, Jan., pp. 34-39.

The concentrations of sulfanilamide, sulfapyridine, sulfathiazole, and sulfadiazine in the aqueous humor were determined after corneal application of the respective drug in ointment form. It was found that sulfanilamide readily penetrated the normal cornea of the rabbit. The cornea of the dog was more impermeable, the amount reaching the aqueous being only 20 percent of that in the rabbit. The other drugs penetrated the cornea only slightly, with more appearing in the rabbit's aqueous in every instance than in the aqueous of the dog. The powdered form of sulfanilamide applied in the conjunctival sac of the rabbit produced a concentration in the aqueous higher than that produced by the sulfanilamide ointment. The concentration was approximately 15 times that in the aqueous of a dog similarly treated. A slight staining reaction of the cornea was noted with the powdered sulfanilamide, and in some instances chemosis as well. In the majority of cases the combined oral and local administration of these drugs would be the most effective procedure. If the efficacy of the drug is dependent only on its concentration, the local application of sulfanilamide and its derivatives might be adequate, particularly for minor external ocular (especially corneal) infections. Reliance should be placed on oral administration in the treatment of virulent and progressive external infective diseases and especially in the treatment of intraocular infections. This is even more true in the case of sulfapyridine, sulfathiazole, and sulfadiazine since the corneal penetration is far less than that of sulfanilamide.

J. Hewitt Judd.

Elvin, N. C. **Preparation of sulfathiazole or sulfanilamide ointment.** Arch. of Ophth., 1942, v. 27, Feb., pp. 373-374.

The author points out that sulfathiazole or sulfanilamide powder should be sifted and made into a paste with an equal amount of boiling water before it is added to an ointment base. He then describes three suitable bases.

J. Hewitt Judd.

Fralick, F. B. **Surgical anatomy of the eye.** Surg., Gyn., and Obstet., 1942, v. 74, Feb. 16, p. 589.

This article discusses anatomic data on the following surgical topics: (1) the limitation of the size of the implant after enucleation, (2) placing iridencleisis and trephine openings under Tenon's capsule, (3) Mules's operation, (4) variability of the thickness of the sclera in inserting sutures, (5) multiplicity of lumina in Schlemm's canal, (6) method of fastening the conjunctiva in a trephine operation in case of buttonholing, (7) tendency to bleeding with incisions at the limbus, (8) poor results in peripheral optical iridec-

tomies because of corneal flattening there, (9) the fact that in basal iridectomy the incision must be well back and that peripheral iridectomy is as efficacious in glaucoma as a complete one, (10) absence of hemorrhage in cutting the iris, (11) choroidal detachment after surgery, (12) the fact that the split occurs in the retina itself in retinal detachment, (13) the advisability of having the scleral opening at least 5 mm. from the limbus in cyclodialysis, (14) the author's recommendation that a hinged scleral opening be made just anterior to the ora serrata for removal of intraocular steel, (15) cysts occurring in the peripheral non-functioning strip of retina at the ora serrata, (16) locating retinal tears, (17) production of papilledema by pressure on the central vein, (18) the fact that the lens capsule thickens with age while the zonular fibers weaken, (19) confusion of subconjunctival foreign bodies with pigmented intrascleral loops, and (20) possibility of forward displacement of the eye 7 mm. without damage to the optic nerve. (10 references.) Ralph W. Danielson.

Grolman, G. von, and Angel, E. **Ophthalmologic study of drugs acting upon the peripheral circulation. 1. Nicotinic acid.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Nov., p. 559.

Nicotinic acid is a new and important therapeutic agent. Taking into consideration its action as a vasodilator and the changes it produces in the arterial pressure of the retina, its experimental study in ophthalmology is of considerable interest. While, in the great majority of cases, ophthalmodynamometric findings show a marked reduction in the maximal and minimal pressures of the central retinal artery, in a few there is a definite increase. The variations in retinal blood pressure produced by nicotinic acid are considerably greater than those observed in the humeral artery. The influence upon the retinal blood pressure is neither uniform nor constant. In only a few cases was it possible to determine a moderate enlargement of the peripheral visual fields, with a slight reduction in the dimensions of the blind spot. There was no qualitative difference in the size of the retinal vessels, the actual micrometric study of which will be the object of a later report. It is reasonable, however, to assume that some degree of retinal vasodilatation takes place and if the accurate measurements bear out that contention, nicotinic acid will be of considerable therapeutic value in many ocular diseases in which the vascular factor plays a basic role. (Fundus photographs, visual-field charts, bibliography.) Plinio Montalván.

Julianelle, L. A., Boots, R. H., and Harrison, G. H. **The treatment of staphylococcal infections of the eye by immunization with toxoid.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 431-436. (References.)

Shroff, C. N. **Chemotherapy in ophthalmology.** Indian Jour. Ophth., 1941, v. 2, July, p. 77.

The actions of sulfonamide compounds are listed and a dosage rule is given. The toxic reactions are noted and the drugs of choice in the treatment of various ocular infections are enumerated. Edna M. Reynolds.

Terry, T. L. **Truss for application of pressure to the eye.** Amer. Jour. Ophth., 1942, v. 25, March, pp. 333-334. (One illustration.)

Turvey, S. E. S. **Rare ocular reactions to tryparsamide.** Amer. Jour. Syph., etc., 1941, v. 25, Sept., p. 623.

The assumption that all ocular reactions occur before the tenth injection of tryparsamide is unwarranted and unsafe. Theodore M. Shapira.

Yudkin, A. M. **Vitamin therapy in ophthalmology.** Amer. Jour. Ophth., 1942, v. 25, March, pp. 284-290. (References.)

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Amoretti, Eduardo. **Zeiss contact glasses in keratoconus and ametropia.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Oct., p. 510.

Twenty-two cases of different forms and degrees of ametropia were fitted by contact glasses with resulting visual improvement. Satisfactory tolerance of the glasses was obtained in 19 of these cases. In the remaining three, sufficient tolerance to warrant prescription of the glasses could not be achieved due to irregularities of the scleral curvature. The technique for insertion and removal of the lenses is discussed in detail. Plinio Montalván.

Birge, H. L. **Aniseikonia.** Arch. of Ophth., 1942, v. 27, Feb., pp. 357-360.

The author briefly reviews the causes and the effects of aniseikonia and makes a plea for the addition of the measurement of aniseikonia to the refractive procedure in each case in which the patient has difficulty after the usual procedures or symptoms indicating size difference in the retinal images.

J. Hewitt Judd.

Broda, E. E. **The role of the phospholipin in visual-purple solutions.** Biochem. Jour., 1941, v. 35, Sept., p. 960.

The authors found that solutions of visual purple contain phospholipin from the retina, the quantity of which is comparable to that of the protein. The light-filter effect due to the phospholipin accounts for the apparent decrease in the efficiency of the decomposition of visual purple in solution in the blue and violet ranges. Its presence also explains the discrepancy in the same range between the photosensitivity curve of visual-purple solutions and the human scotopic sensitivity range. T. E. Sanders.

Carson, L. D. **Visual acuity and speed of recognition.** United States Naval Med. Bull., 1942, v. 40, Jan., pp. 183-186. (See Section 1, General methods of diagnosis.)

Moore, J. I. **A visual-test card designed for use in examinations for the armed forces.** Arch. of Ophth., 1942, v. 27, March, pp, 460-465.

A visual-test card has been designed to meet the special requirements of examinations for the armed forces. Particular attention has been given to those levels of vision that divide the men examined into the various classes as far as vision is concerned. The size of the letters is such that there are lines on the chart which should be read at 15 and at 10 feet respectively, corresponding to the line read at 20 feet for the various levels for vision. It is recommended that the vision of each eye be tested at a distance of 20 feet from the card, and again at 15 feet from the card if the vision is below the acceptable limit. Many malingerers after several examinations, know how much they are expected to read at 20 feet, but have no idea how much they should read at 15 or 10 feet. This method is of value in more clearly differentiating the borderline cases as well as pointing out malingerers. J. Hewitt Judd.

4
OCULAR MOVEMENTS

Alvaro, M. R. **Recent trends in the surgery of heterotropia.** Surg., Gyn., and Obstet., 1942, v. 74, Feb. 16, pp 628-641.

This article is so full of information that it is difficult to abstract. The author discusses the following: age of patient, tenotomy, weakening of muscular action through methods other than tenotomy (recession), advancement, resection, tucking, anesthesia, instruments, sutures, cinch operation, methods of correcting after-effects and bad operative results, and paralysis of each of the various extraocular muscles. (5 figures, 83 references.)

Ralph W. Danielson.

Baum, W. W. **Muscle imbalance in myopia.** Amer. Jour. Ophth., 1942, v. 25, March, pp. 291-295; also Trans. Pacific Coast Oto-Ophth. Soc., 1941, 29th mtg. (References.)

Campbell, Ian. **Dark adaptation and miners' nystagmus.** Brit. Med. Jour., 1941, Nov. 22, p. 726. (See Section 10, Retina and vitreous.)

Clarke, C. C. **Strabismus in the New Haven dispensary.** Yale Jour. of Biol. and Med., 1942, v. 14, Jan., pp. 291-295.

In a series of 379 cases of strabismus, the author found that 63 cases (17 percent) were of exotropia, 313 (82 percent) esotropia, and 4 (1 percent) pure hypertropia. Thirty-three percent of the esotropias and 59 percent of the exotropias were of the alternating type. Forty-five percent of the strabismus cases also had some degree of hypertropia. Clarke concludes that about half of such cases need operation, and that amblyopia ex anopsia is a preventable condition which requires treatment in the pre-school period.

T. E. Sanders.

Correa, C. **Sensorio-sensitive-motor traumatic ophthalmoplegia.** Ophtalmos, 1941, v. 2, no. 2, pp. 428-442. (See Section 16, Injuries.)

Davis, W. T. **Results of operation for heterophoria and heterotropia and causes of failure.** Surg., Gyn., and Obstet., 1942, v. 74, Feb. 16, p. 577.

Davis discusses the fact that etiologically strabismus and phoria cases are mechanical or accommodative, or mechanical plus accommodative. In the mechanical cases surgery is primarily indicated, whereas in accommodative cases such measures as orthoptic exercises and correction of the ametropia should be employed. (2 references.)

Ralph W. Danielson.

Gifford, S. R. **Position of muscles after operation for strabismus.** Arch. of Ophth., 1942, v. 27, March, pp. 443-459.

The findings at reoperation in 24 cases are reported. The tendency for the internal rectus muscle to slip back for an indefinite extent on the sclera after tenotomy was demonstrated in four cases. Even after many years, great improvement may be obtained in such cases by isolating the muscle and replacing it at or slightly in front of its previous insertion. When contracture of the external rectus muscle is severe a recession is necessary. Recession produced in most cases a new insertion at or very close to the location of the scleral sutures. In two cases bands of muscle became adherent behind this point, resulting in overeffect and limitation of adduction. Care in placing forceps and sutures and careful

hemostasis should make this complication a rare one. In one case and possibly a second, muscle fibers became adherent or grew forward in front of the scleral sutures, resulting in an insufficient effect. In neither case had shortening of the opponent been performed. After Reese resection and tucking, adhesions, which nullified the effect of the operation, were found far back of the original insertion. These were probably due to necrosis of muscle fibers or to clot formation with resulting adhesion of the muscle at the point which is not necrotic. In a case of resection and advancement adhesion occurred to the previous insertion but not behind it. It is suggested that resection plus advancement to a scleral groove gives a firm and broad insertion which is perhaps not so apt to extend back of the original insertion as after resection alone or tucking, in which fibers are traumatized in a location where they may easily become adherent to the sclera. After myotomy of the inferior oblique muscle, it may become reattached near its origin unless 4 mm. of the muscle has been resected and it has been completely freed from fascial attachments. In two cases of tendon transplantation for abducens-nerve paralysis the tendon slips were found in good position inserted firmly beneath the external rectus muscle. After Wiener's procedure, the superior oblique muscle may slip back of its sutured position and above this point unless it is freed from fascia far back in the orbit and made to pass horizontally toward its new insertion. Coagulation for retinal detachment may cause adhesions of muscles to the sclera, whether or not these have been resected. Such adhesions do not prevent deviation of the eye in the direction of the adherent muscle when a tendency to divergence is present. Insertions abnormally far from the limbus were found in several muscles not previously operated on.

J. Hewitt Judd.

Krimsky, Emanuel. **The cardinal anglometer.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, 45th mtg., May-June, p. 222. (See Amer. Jour. Ophth., 1942, v. 25, April, p. 492.)

Kronenberg, Bernard. **New mask for operations on eye muscles.** Arch. of Ophth., 1942, v. 27, Jan., pp. 162-163.

In order to facilitate repeated examination of the opposite eye, especially during muscle operations, a mask has been devised with two temporally hinging flaps in the operative sheet. These flaps are reinforced by binding which is wide enough so that each flap will completely cover the opening and small enough so that the flaps will meet at the center of the nose piece and not interfere with each other.

J. Hewitt Judd.

Prangen, A. de H. **Differential diagnosis of the phorias.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, 45th mtg., March-April, p. 60.

In establishing correct diagnoses of muscle imbalance the factor of time is important and repeated observations are most useful. Insufficiency or excess of divergence and convergence are definite diagnostic entities. The author's philosophy holds that, excluding definite strabismus and obvious deviation, any state of extraocular muscle balance which causes a person no discomfort is normal for that individual. (Discussion.) George H. Stine.

Souders. B. F. **Hysterical convergence spasm.** Arch. of Ophth., 1942, v. 27, Feb., pp. 361-365.

A case of hysterical convergence spasm in a woman 22 years of age is reported. The disease represents an excess of convergence, usually associated with a comparable excess of accommodation, which becomes pathologic because of its duration and severity in susceptible, psychoneurotic patients. Suggestion probably plays a prominent part in the causation of the disease, and it is in this connection that orthoptic-training exercises might in some cases be incriminated. In Souders' case it was thought that this type of therapy presented a new outlet for a long-standing psychoneurosis. J. Hewitt Judd.

Vail, Derrick. **Surgical management of heterophoria.** Surg., Gyn., and Obstet., 1942, v. 74, Feb. 16, p. 567.

Vail defines heterophoria as a break in the amplitude of fusion, or the decompensation of muscle balance as maintained by fusion and the neuromuscular mechanism. He believes that cases should be operated upon only when the phoria produces symptoms that can be relieved in no other way, and provided that there is some degree of fusion power available and capable of being increased in its amplitude. The author warns that the more closely the false image approaches the true one without fusion the more annoying it becomes. Vail quotes from Spaeth's book a table in which are given rules for deciding on surgical procedure for the phorias. (3 references.)

Ralph W. Danielson.

White, J. W. **Paralysis of the superior rectus and the inferior oblique muscle of the same eye.** Arch. of Ophth., 1942, v. 27, Feb., pp. 366-371; also Trans. Sec. on Ophth. Amer. Med. Assoc., 1941, 92nd mtg.

Although the exact cause of this condition is uncertain, the history of difficult labor and especially forceps injuries is too frequent to be disregarded. In cases of complete paralysis, the screen comitance is the only test which can be depended upon. There are three different varieties of the anomaly: (1) that in which binocular single vision is maintained, usually by a backward tilting of the head to get the image more in the field of the depressor muscle; (2) that in which fixation is with the nonparetic eye when the paretic eye is in a position of hypotropia (it is in this type that the ptosis, either true or false, is the most marked); (3) that in which fixation is with the paretic eye and the sound eye has a marked secondary deviation, which makes the deformity much more disfiguring than that accompanying either of the other varieties. (Discussion.) J. Hewitt Judd.

White, J. W. **The importance of complete diagnosis to successful treatment of strabismus.** Surg., Gyn., and Obstet., 1942, v. 74, Feb. 16, p. 565.

White urges a complete study of the case in order to better choose the nonoperative or operative methods of procedure. Deviation tests for distance and for near with and without correction should be made to determine whether divergence or convergence excess or insufficiency is present. The effect of complete cycloplegia and of correction of any vertical anomaly should be noted. The deviation should be measured in the six cardinal fields and the fixing eye determined. The presence and degree of binocular fixation or suppression should be established. The history should be investigated as to heredity, illness, and birth or other injury, as well as neurologic abnormalities. The author states that orthoptic

training is in some cases a most helpful adjunct, but when orthoptic training is prescribed for a majority of patients with heterotropia, it is done through ignorance or dishonesty and may do much harm.

White believes that when a patient who has been carefully studied fails to respond satisfactorily to any probable nonoperative treatment, surgery should be considered, and before school age unless there is a definite contraindication. Ralph W. Danielson.

5

CONJUNCTIVA

Arruda, Jonas de. **Epithelioses and avitaminosis "A."** Ophtalmos, 1941, v. 2, no. 2, pp. 402-413.

The author, who gives tables showing the character of the cases treated with vitamins, found that the vitamin régime of itself, when it did not prove ineffective, made only a very slow improvement in the symptoms attributed to avitaminosis. Ocular instillation of vitamin A was found of little use in conjunctival xerosis, probably because epithelial keratinization rendered absorption difficult. (6 illustrations.)

W. H. Crisp.

Berliner, M. L. **Regarding the early detection of avitaminosis-A by gross or biomicroscopic examination of the conjunctiva.** Amer. Jour. Ophth., 1942, v. 25, March, pp. 302-308. (One table, 5 figures, references.)

Bilger, Izzet. **Therapeutic effects of prontosil in ocular diseases.** Türk Oft. Gazetesi, 1939, v. 3, pt. 3, p. 160. (French abstract, p. 201.)

Prontosil gave gratifying results in a number of trachoma cases.

George A. Filmer.

Cheney, J. W. **The treatment of trachoma with neoprontosil.** Trans. Amer. Acad. of Ophth. and Otolaryng., 1941, 45th mtg., March-April, p. 66.

The author holds that local instillations of a 5-percent solution of neoprontosil should be used in every case of trachoma, and alone will effect a cure in the majority of grade-three cases. It is also valuable as an adjunct to the internal use of the sulfonamide drugs. (Discussion.) George H. Stine.

Gözcü, N. **A case of xerophthalmia from psoriasis.** Türk Oft. Gazetesi, 1939, v. 3, pt. 1, p. 12. (French abstract, p. 60.)

A man suffering from psoriasis developed irritation of the left eye. What appeared to be a ruptured chalazion of the conjunctival surface of the upper lid was curetted and cauterized with silver nitrate. Gradually an appearance of papillary conjunctivitis developed and progressed to the appearance of xerosis of the palpebral and bulbar conjunctiva, with ectropion of the lower lid. Treatment proved ineffective, and the eye was later enucleated.

George A. Filmer.

Julianelle, L. A., and Smith, J. E. **Studies on the infectivity of trachoma. 11. The effect of sulfanilamide on the virus.** Amer. Jour. Ophth., 1942, v. 25, March, pp. 317-321. (2 tables, references.)

Krishnamurti, K. **Sulfanilamides in trachoma.** Indian Jour. Ophth., 1941, v. 2, Jan., p. 6.

The following methods of treatment are advised by the author. (1) In simple cases of trachoma, 6-percent sulfanilamide ointment is applied morning and evening for one or two months. Improvement is noted within

ten days. (2) In acute bacterial conjunctivitis, 5 c.c. of prontosil is injected daily for five days. In addition, 2-percent silver nitrate is used for touching on alternate days. Five-percent sulfanilamide drops are used both morning and evening. Improvement is noticed within five days. (3) In corneal ulcer, if the ulcer is acute with deep inflammation, sulfanilamide is injected daily or on alternate days, about five times. If the ulcer is not so acute, 45 grains of sulfanilamide are given every day for about ten days. Locally, atropine and antiseptic washes are used. At bedtime, 6-percent sulfanilamide eye ointment is applied. The ointment and atropine are continued for another 15 days. Improvement is noticed within ten days. In pannus, 6-percent sulfanilamide ointment is applied morning and evening. At bedtime 2-percent plasma and 1-percent dionin ointment is applied. Biweekly subconjunctival injections of saline are given 10 to 15 times. Copper is completely avoided. Improvement is noticed within 15 days. In addition to treatment with sulfanilamide all patients receive cod-liver oil daily and in case complications arise in giving sulfanilamide, liver therapy is advocated.

Edna. M. Reynolds.

Laborne Tavares, C. **Treatment of symblepharon with contact shell.** Ophtalmos, 1941, v. 2, no. 2, pp. 424-427.

In a case of posterior symblepharon of the outer third of the upper lid and complete symblepharon of the lower lid, the author had in 1928 the idea of interposing a Zeiss contact glass between the bleeding surfaces of the operative wound. After employing this porcedure in several operations, he replaced the contact glass with a silver shell 0.9 mm. thick and having corneal and scleral radii of 8 and 12 mm. respectively. The shell has several minute openings in the corneal region, to favor circulation of normal and therapeutic fluids. The silver is regarded as maintaining almost complete asepsis of the operative field. W. H. Crisp.

Laje Weskamp, Rodolfo. **Sulfonamides in the treatment of gonococcic conjunctivitis.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Dec., p. 614.

Two cases of gonococcic conjunctivitis in adults were treated with sulfanilamido-pyridin (Dagenan). Twenty-four hours after the initial dose there was a marked attenuation of the symptoms and one week later there was a complete cure, with negative bacteriologic smears. The pharmacology and the methods of administration of sulfonamides are discussed. (Bibliography.) Plinio Montalván.

Maldonado Allende, I., and Joisen, M. **A case of primary tuberculous infection of the conjunctiva.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Dec., p. 625.

Primary tuberculous infection of the conjunctiva is reported in a woman 33 years of age. The lesion consisted of numerous yellowish-gray nodules in the left lower conjunctival fornix near the caruncle. It was covered by a thin mucopurulent exudate and was accompanied by enlargement of the submaxillary glands. The general physical examination, X ray of the chest, and intradermal tuberculin tests were negative. The positive diagnosis was established by the presence of tubercle bacilli in pus obtained from the lesion by puncture. The differential diagnosis between primary and secondary tuberculous infection of the conjunctiva, the pathogenic mechanism, prognosis, and

treatment are fully discussed. (Illustrations, bibliography.)

Plinio Montalván.

Patwardhan, D. G. **Treatment of chronic trachoma.** Indian Jour. Ophth., 1941, v. 2, Jan., p. 8.

For the first stage of trachoma the author recommends medical treatment only—painting of the everted lids with 1-percent silver nitrate daily and the use of chaulmoogra oil with vigorous rubbing nightly. This treatment is continued for a week or so and then the everted lids are painted with 25-percent argyrol in the morning and with copper-sulphate solution in glycerine or chaulmoogra oil in the evening for a month or more. Later the patient is instructed to instill 5-percent argyrol in the morning and an ointment consisting of chaulmoogra oil and copper sulphate at night. Once a week for six or eight weeks copper-sulphate stick is used. During the second stage, the granules are scraped out first and then medical treatment is followed with daily use of 1-percent silver nitrate and nightly applications of chaulmoogra oil as in the first stage. During the third stage, the use of caustics is contraindicated. The author routinely does a tarsectomy, which he describes in detail. During the fourth stage also, any severe caustic remedy is contraindicated. Cod-liver oil is used locally as well as internally. Peritomy is recommended for the relief of persistent pannus, and nonspecific protein therapy is advised for relief of persistent photophobia.

Edna M. Reynolds.

Schreiner, K., and Schreiner, V. **Chemotherapy of gonoblennorrhea of the newborn.** Wiener klin. Woch., 1941, v. 54, May 23, pp. 452-454.

Three cases are reported in great detail in which the mother's vaginal, cervical, or urethral gonorrhea was treated with one of the sulfonamide preparations, and only the usual local treatment with silver nitrate and regular irrigations was employed for the infant's ophthalmia, which, in two of the three instances, was very violent. After three days the inflammatory symptoms subsided strikingly, and there was a marked decrease in the number of gonococci in the conjunctival scrapings. After five days the scrapings were negative in all three cases. While there is as yet insufficient knowledge as to the amount of sulfonamide compounds excreted in mothers' milk, the authors feel that there is some practical evidence of the value of this form of medication, at least as a supporting therapy. Bertha A. Klien.

Sugita, Y., Sugita, S., Sugita, A. **Further studies on the properties of Prowazek and other inclusion bodies, especially those artificially produced.** Graefe's Arch., 1940, v. 142, pt. 4, pp. 428-436.

When a clear solution of centrifuged cowpox vaccine is injected into the protoplasm of a conjunctival epithelial cell with a micropipette and a micromanipulator (Amer. Jour. Ophth., 1940, v. 23, p. 1188), the solution diffuses outward and produces a clouding. After repeating this procedure forty to sixty times with intervals of from ten to fifteen minutes the cell is stained with Loeffler's or Giemsa's solution. In cells so treated it was found that a disc-shaped portion of the protoplasm became filled with small corpuscles resembling inclusion bodies. The authors consider these bodies to be coagulated protein produced by the vaccine. They think it probable that a similar effect

produced by viruses on the living cells is the explanation for inclusion bodies.

Frances C. Cogan.

Thygeson, P., and Stone, W., Jr. **Epidemiology of inclusion conjunctivitis.** Arch. of Ophth., 1942, v. 27, Jan., pp. 91-122; also Trans. Sec. on Ophth., Amer. Med. Assoc., 1941, 92nd mtg.

Epidemiologic data derived from the study of fifty cases of inclusion conjunctivitis in infants, children, and adults are analyzed and lead to the conclusion that the reservoir of the virus is a mild genito-urinary disease which is probably transmitted venereally and in which low-grade nongonococcic urethritis is the lesion in the male, and subclinical cervicitis, apparently limited to the region of transitional epithelium just within the external os, the lesion in the female. The association of this virus infection with gonorrhea is common, but the two conditions appear to be entirely independent. In this series the most common means of transfer to the eye was birth-canal infection of infants during delivery, which accounted for the infection in all the infants. Other means of transmission included transfer by way of swimming pools, accidental infection of gynecologists or obstetricians with genito-urinary secretions, and probably transfer of genito-urinary material to the eye by perverted sexual intercourse. Eye to eye transfer was rare except in infants, in whom infections beginning unilaterally not uncommonly spread to the other eye. Nine instances of ocular infection which was probably spread from eye to eye by means of a tonometer are cited. The parallelism of the epidemiology of inclusion conjunctivitis with that of gonorrhea appears to be very close, except that gonorrhea does not seem to be transfered via swimming pools. Two methods of demonstrating the virus of inclusion conjunctivitis were employed in this study: (1) the microscopic demonstration of inclusion bodies and their components, the free elementary and initial bodies in epithelial scrapings from the lesions, and (2) the production of characteristic follicular conjunctivitis in baboons in material from which the inclusion bodies could be demonstrated regularly. The differential diagnosis between the viruses of trachoma, inclusion conjunctivitis, and lymphogranuloma venereum is discussed. (Discussion.)

J. Hewitt Judd.

Turtz, C. A. **Verruca as a cause of unilateral conjunctivitis.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 452-453.

6

CORNEA AND SCLERA

Artigas, Marcelino. **Recurrent corneal herpes with poliosis of the eyelashes.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Dec., p. 637.

A 33-year-old patient suffering from recurrent corneal erosions of herpetic origin gradually developed poliosis of the lashes of the affected eye three months after the first attack. The lashes in the middle portion of the lid margin were the first to turn gray, the process spreading later to the rest of the lashes in both lids. There were also hypochromic disturbances of the neighboring skin with decreased corneal sensitivity. Clinical and laboratory examinations were essentially normal. The etiology of poliosis is briefly discussed and the present case lends support to the theory of a filtrable virus as the causative factor. (Photographs, bibliography.)

Plinio Montalván.

Ayberk, N. F. **Two cases of keratoplasty.** Türk Oft. Gazetesi, 1941, v. 3, pt. 9, p. 405. (French abstract, p. 441.)

The author used a 2.5-mm. trephine of his own design. In one case the graft became completely opaque, while in the other it remained semintransparent.

George A. Filmer.

Balaban, Salahattin. **Orbital phlegmon following perforating corneal ulcer.** Türk Oft. Gazetesi, 1941, v. 3, pt. 10, p. 463. (French abstract, p. 476.) (See Section 13, Eyeball and orbit.)

Başar, Irfan. **A case of corneal fistula.** Türk Oft. Gazetesi, 1941, v. 3, pt. 9, p. 421. (French abstract, p. 444.)

A woman with serologic evidence of syphilis presented central corneal opacities. Following an optical iridectomy, two vesicles appeared in the corneal opacity, and from time to time the eye became irritated. X-ray treatment was deemed to give the best results.

George A. Filmer.

Bolettieri, D. **Contribution to the study of primary adiposis of the cornea.** Boll. d'Ocul., 1940, v. 19, March, pp. 175-206.

Bolettieri reports six cases of fatty degeneration of the cornea. Two of these were of the annular type, and four of the discoid type of Rohrschneider. X-ray treatment gave good results in all six cases. The author states that primary adiposis of the cornea is an infiltration of fat resulting from changes in lipoid metabolism. The annular type occurs around the limbus, while the discoid type manifests itself in more or less large spots of yellowish-gray color in symmetric sections of the cornea, reaching to the pupillary area. Stained with Sudan, an intense infiltration by fatty cells is found among the corneal lamellae. (Bibliography; 16 figures, 6 colored.) M. Lombardo.

Bruce, G. M., and Locatcher-Khorazo, D. **Actinomyces.** Arch. of Ophth., 1942, v. 27, Feb., pp. 294-298.

A branching filament, culturally and morphologically resembling the actinomyces group, was isolated from the conjunctiva of a patient, aged fifty years, with punctate keratitis. The corneal lesions were deeper than the superficial areas sometimes accompanying conjunctivitis and seemed to be similar in all respects to those of typical superficial punctate keratitis. Although the role of the fungus in the production of the corneal lesion can only be conjectured, it is significant that the eye in which the streptothrix was not found remained healthy and that recovery from the keratitis in the other eye coincided with the disappearance of the fungus from the conjunctival sac. An intracorneal injection of the suspension of the living filament into a rabbit's eye resulted in a corneal abscess. Intraperitoneal injection into mice gave no pathologic effects. An intradermal injection in a guinea pig resulted in a small nodule at the site of the injection.

J. Hewitt Judd.

Cogan, D. G., and Kinsey, V. E. **The cornea. 1. Transfer of water and sodium chloride by osmosis and diffusion through the excised cornea.** Arch. of Ophth., 1942, v. 27, March, pp. 466-476.

For these experiments ten corneas were excised and securely tied onto the flared end of 5-c.c. graduated pipettes. The tubes, which were supported on individual ring stands, were partially filled with one fluid, and the ends holding the corneas were emersed in flasks

containing the second fluid. It was found that a net transfer of water through the excised cornea by osmosis can be demonstrated in the posterior to anterior direction and that this transfer depends on the maintenance of the osmotic pressure by an intact epithelium. No net transfer of water can be demonstrated in the anterior-to-posterior direction under otherwise similar experimental conditions because of the formation of bullae and consequent epithelial damage which occur whenever the sodium chloride concentration is higher on the posterior than on the anterior surface. From experiments with deuterium oxide (heavy water) it may be inferred that water is transferred through the excised cornea by diffusion in both directions but the epithelium somewhat decreases the rate of transfer. An appreciable transfer of chloride through the excised cornea by diffusion can be demonstrated in either direction only when the epithelium is damaged or removed as the epithelium is essentially impermeable to sodium chloride in either direction.

J. Hewitt Judd.

Davis, W. T. **Superficial punctate parenchymatous keratitis.** Arch. of Ophth., 1942, v. 27, Feb., pp. 279-293; also Trans. Sec. on Ophth., Amer. Med. Assoc., 1941, 92nd mtg.

Davis describes superficial punctate parenchymatous keratitis as a disturbance of the subepithelial tissues of the cornea, resulting in the formation of minute flecks and wavy lines which usually occurs with conjunctivitis. It is usually bilateral, and disappears without leaving any trace. There is no involvement of the corneal epithelium. The author summarizes the symptoms and findings in 195 cases observed during 13 years. Bacterial studies of the conjunctival secretions have given negative results in all cases. (Discussion.)

J. Hewitt Judd.

Dejean, Ch. and Ferrié, J. **Tuberculous pseudotrachoma, its keratopannus form.** Arch. d'Opht. etc., 1939-1940, v. 3, no. 12, p. 1057.

The authors call attention to a certain kind of keratitis with pannus which may be misinterpreted as trachomatous pannus but, after observation over a period of years, proves to be tuberculous. The following peculiarities are emphasized: In opposition to trachomatous pannus, the corneal involvement is usually unilateral. In spite of persistence up to twelve years, trachomatous entropion does not occur. The pannus is not restricted to the upper corneal segment. The vessels composing the pannus of these cases are not as parallel to each other as are those in trachoma, and more branching and tortuosity is found. The pattern of a superficial and an interstitial network of newly formed vessels is described, the latter being situated near the membrane of Descemet. The corneal opacities are restricted neither to the superficial layers nor to the upper segment of the cornea. Whitish nodules are observed which definitely differ from those described by Cuenod and Nataf. They are conic in shape and are situated in deeper layers than trachomatous nodules of the cornea. They are unequal in size and the authors hint that they may be true tuberculous formations. Iritis may be associated with severe corneal involvement. The same is true for scleritis and for sclerosing keratitis. In spite of the presence of papillary hypertrophy and follicles in the conjunctiva of the lids, the typical trachomatous granules are missing in these cases. Polypoid vegetation occurs. The suc-

cess of antituberçulous therapy confirms the assumed etiology. (8 case reports, 3 colored pictures.)

K. W. Ascher.

Donahue, H. C. **Lipoid degeneration of the cornea.** Amer. Jour. Ophth., 1942, v. 25, March, pp. 261-264. (One illustration, references.)

Gifford, S. R. **Ring ulcer of the cornea.** Arch. of Ophth., 1942, v. 27, Feb., pp. 231-241; also Trans. Amer. Ophth., Soc., 1941, v. 39, p. 261.

The author reviews the literature and points out the fact that ring ulcer or ring infiltration may be due to different etiologic agents. Two types are described which have in common the development of a ring infiltrate which surrounds, more or less completely, the central portion of the cornea and threatens its integrity. The central portion at first remains clear, but if the infiltrate is inadequately treated it rapidly becomes opaque, leaving a scar which greatly reduces vision. The first type appears in those cases of trachoma in which vessels are present all around the cornea and numerous infiltrates occur simultaneously at the ends of these. In the second type a ring infiltrate is seen during or just after an infection of the respiratory tract, or in some cases without any previous illness. It usually occurs in young, apparently healthy, adults. It is thought that a spastic contraction of already diseased capillaries must occur in some cases, because of the rapid development of the symmetric areas of necrosis. This type is due chiefly to Zur Nedden's bacillus, the Morax-Axenfeld diplobacillus, probably the virus which causes superficial punctate keratitis, and other bacteria. Four cases of the first type and three of the second are reported to show the value of delimiting keratotomy. An early keratotomy, which is placed just central to the most active portion of the ulcer, entirely alters the prognosis for vision. The wound is kept open by repeated decompression for sufficient time to allow healing of the remainder of the ulcer. (6 photographs.)

J. Hewitt Judd.

Gögüs, Mustafa. **Disciform keratitis.** Türk Oft. Gazetesi, 1940, v. 3, pt. 7-8, p. 390. (French abstract, p. 403.)

In a 14-year-old boy the corneal lesion developed subsequent to repeated attacks of labial herpes. Treatment was without much effect.

George A. Filmer.

Klemens, F. **Congenital bilateral central corneal opacities.** Graefe's Arch., 1940, v. 142, pt. 4, pp. 392-400.

Congenital bilateral opacities in the corneas of a six-year-old boy are described. There was a disc-shaped opacity lying in the deep layers of the central portions of the cornea of each eye, and on the edges of these opacities lay thick grayish-white flecks which extended through to the posterior corneal surfaces. Small particles of pigment could be seen upon these flecks. In the region of the opacity a few small pigmented adhesions extended from the cornea to the iris. The endothelium in the affected areas was present but abnormal. The corneas were somewhat thinned in the affected region but appeared normal elsewhere. With the further exception of a small pigment spot on the right anterior lens capsule the eyes were essentially normal. Similar defects were found in three out of four rabbits in one litter, suggesting an hereditary factor.

The author considers the condition described as a developmental anomaly

which occurs at the time that the mesoderm is differentiating into corneal endothelium. For some reason (possibly hereditary) the central portion does not entirely undergo differentiation, the result being an opacity. The adhesions to the iris have a similar basis in the pupillary membrane. The fact that both lenses were normal speaks against the theory that the defect is due to abnormal pressure by the embryonic lens on the posterior corneal surface. Frances C. Cogan.

Lugossy, Gyula. **Bilateral corneal degeneration following vernal catarrh.** Graefe's Arch., 1940, v. 142, pt. 4, pp. 448-452. (See Amer. Jour. Ophth., 1941, v. 24, p. 467.)

Pascheff, C. **Recent investigations pertaining to follicular pannus and to the transplantation method of Denig.** Arch. d'Opht. etc., 1939-1940, v. 3, no. 11, p. 974.

The fact that trachomatous pannus is a genuine corneal trachoma is emphasized. The author suggests that confluent trachomatous follicles be called folliculoma. When the cornea is covered by folliculomas he proposes the term folliculomatous pannus. The eyes of an 18-year-old female patient and the pathology of the specimen obtained by Dennig's operation are described. The absence of exudative inflammatory changes is stressed and the hyperplastic character of the reticulo-endothelial changes is emphasized. (8 photomicrographs.) K. W. Ascher.

Peyret, J. A. **Marginal dystrophy of the cornea.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Sept., p. 459.

Two cases of unilateral marginal dystrophy of the cornea in young women are reported. In the early stages the cornea stained with fluorescein and later the typical picture of marginal dystrophy appeared. The condition is due to a low-grade inflammatory process with simultaneous degenerative changes. The interest of these cases lies in their unilateral character. This type of corneal dystrophy is described at length. (Stereoscopic photographs, bibliography.) Plinio Montalván.

Rezende, Cyro de. **Cadaver cornea in keratoplasty.** Ophtalmos, 1941, v. 2, no. 2, pp. 335-343.

A brief survey of the subject, the author's experience being limited to eight cases not selected as to suitability. One eye was lost by panophthalmitis. With one exception, the remaining eyes showed the transplant in good condition as to translucency about two months after operation.

W. H. Crisp.

Rocha, Hilton. **Double gerontoxon.** Ophtalmos, 1941, v. 2, no. 2, pp. 372-377.

Two cases are recorded, in women aged 45 and 74 years respectively. Two opaque symmetric arcs, without vascularization, and with typical clear intervals, were seen in each eye. Each patient showed hypercholesterinemia, the amounts being respectively 210 and 281.9 mg. per 100 c. c.; and also low basal metabolism and hypothyroidism. (Photographs and biomicroscopic drawing.) W. H. Crisp.

Samuels, Bernard. **Lesions in the lens caused by purulent corneal ulcers.** Arch. of Ophth., 1941, v. 27, Feb., pp. 345-352; also Trans. Amer. Ophth. Soc., 1941, v. 39, p. 66. (See Section 9, Crystalline lens.)

Sander, Muzaffer. **A rare case of senile degeneration of the cornea.** Türk

Oft. Gazetesi, 1940, v. 3, pts. 7-8, p. 375. (French abstract, p. 401.)

A 59-year-old woman had noticed visual impairment for four months. There were no signs of inflammation; but the corneal sensitivity was diminished and there were numerous fine opacities in the stroma, scattered around the periphery. The epithelium and Bowman's membrane were normal. Treatment was ineffectual.

George A. Filmer.

Santoni, Armando. **Researches on the anaphylactic capacity of the corneal proteins.** Ann. di Ottal., 1940, v. 68, Oct., pp. 759-770.

Rinaldi, whose method of gauging sensitization depended upon deviation of the complement, previously showed that the corneal proteins do not have antigenic properties. Researches by Grancini, however, led to opposite conclusions, namely, that corneal proteins are anaphylactogenic and even tissue specific.

Santoni reports in this paper his study of the capacity of corneal proteins of the ox and the sheep to induce a state of sensitization in the guinea pig. His animals were first injected intraperitoneally with a suspension of the proteins in question. After an appropriate time sensitization was determined with the aid of a vascular preparation of the animal that had received the injection. The supposedly antigenic substance, in being allowed to pass through the preparation, causes a vasoconstriction if sensitization has resulted, and a quantitative determination of the latter can be made by counting the drops that pass through the preparation per unit of time. Nothing in this study permitted the conclusion that a state of anaphylaxis had been induced. Corneal proteins, therefore, are like those of the crystalline lens (another nonvascular tissue) and unlike other protein substances in being unable to induce a state of sensitization. The author discusses the bearing of his results on Löwenstein's theoretical explanation of the pathogenesis of certain processes at work in keratitis.

Harry K. Messenger.

Wetzel, J. O. **Dendritic keratitis.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 409-423. (Bibliography.)

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Ayberk, N. F. **Therapeutic value of Rubrophen in ocular tuberculosis.** Türk Oft. Gazetesi, 1941, v. 3, pt. 10, p. 450. (French abstract, p. 473.)

Rubrophen by mouth and by vein was administered to three patients with tuberculous uveitis, one of the cases showing nodules in the iris. After three weeks the inflammatory signs had subsided, the vision improved, and the iris nodules disappeared.

George A. Filmer.

Charlin, Carlos. **Masked tuberculosis of the eye.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Oct., p. 489.

The author reports two cases of uveitis in which the clinical picture showed a nonspecific character and was treated as such for a period of time until further search into the past history, careful roentgenologic examination, and the results of tuberculin injections revealed the true tuberculous etiology. The prevalence of this masked form of tuberculosis of the eye is emphasized, and a trial course of tuberculin is advocated in those cases of intraocular inflammation of obscure etiology.

Plinio Montalván.

Focosi, M. **The clinical and histopathologic aspect of postoperative epithelization of anterior chamber.** Boll. d'Ocul., 1940, v. 19, March, pp. 207-222.

In two women, 63 and 70 years of age respectively, epithelial-cyst formation of the anterior chamber occurred after cataract extraction. In the first case a grayish formation was visible in the upper half of the anterior chamber and the intraocular pressure was increased. Biomicroscopy indicated that the opacity was due to a membrane which adhered to the posterior surface of the cornea. At the limits of the chamber the membrane reflected toward the iris, covering the anterior surface and adhering to a secondary cataract in the pupillary area. Microscopic examination disclosed the fact that the membrane originated from a mass of epithelial cells situated at the site of the original corneal incision. The glaucoma was apparently due to the occlusion of the corresponding angle of the chamber. In the other case the same type of epithelial proliferation formed a true bilobate cyst. In this case the intraocular pressure was not increased. X-ray and radium therapy checks the progress of the disease by destroying the newly formed epithelium in its initial stage. The writer emphasizes the importance of early diagnosis before secondary changes take place. (Bibliography, 5 figures.) M. Lombardo.

Grolman, G. von. **Postoperative and posttraumatic iridocyclitis and tuberculous allergy.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Oct., p. 519.

The author reports three cases of cataract extraction and one case of penetrating injury of the eyeball each of which developed postoperative or traumatic iridocyclitis several days after the operation or injury. The Mantoux intradermal tests were positive and tuberculin treatment was instituted with beneficial effect. The author believes that tuberculosis is a frequent cause of postoperative iridocyclitis. This complication is characterized by its late appearance, usually on the tenth day after the operation, the severity of the symptoms, and the response to tuberculin treatment and other hygienic measures. (Bibliography.)

Plinio Montalván.

Kinsey, V. E., Grant, M., and Cogan, D. G. **Water movement and the eye.** Arch. of Ophth., 1942, v. 27, Feb., pp. 242-252.

The movement of water into and out of the eye has been measured by using heavy water (D_2O) as a tracer substance, since its diffusion rate is practically identical with that of ordinary water and yet its density is about 10 percent greater. Thus the proportion of heavy water in any mixture can be calculated from the specific gravity of the mixture, and the water movements may thereby be followed by determining either the rate at which the heavy water is diluting ordinary water or by the converse of this. One half of the water in the aqueous of the rabbit was found to be replaced every 2.7 minutes. This corresponds to a total water movement into or out of the anterior chamber of approximately 50 cu. mm. per minute. It was experimentally calculated that one half of the water in the vitreous of the rabbit was replaced every 10 to 15 minutes. This would correspond to a total water movement into and out of the vitreous of approximately 85 cu. mm. per minute. In the aqueous of the monkey one half of the water was found to be replaced in less than seven minutes, which would correspond to a total water movement into

or out of the anterior chamber of more than 13 cu. mm. per minute. The quantity of water going from the aqueous to the vitreous and the lens of the rabbit was found to represent but a small portion of the total water movement out of the aqueous. The rate of total water movement into or out of the aqueous is about fifty times as great as has recently been reported for the so-called rate of flow of whole aqueous by Friedenwald and Pierce. It would appear that a large part of the total water movement consists of water in the blood exchanging for water within the eye. Such reactions are probably simply expressions of the kinetic energy of the molecules involved. These findings are in complete agreement with the more recent concepts of the dynamic state of all the body constituents.

J. Hewitt Judd.

Moore, E., Scheie, H. G., and Adler, F. H. **Chemical equilibrium between blood and aqueous humor.** Further studies. Arch. of Ophth., 1942, v. 27, Feb., pp. 317-329.

The urea content of the aqueous is a vital point in evaluating the theory of dialysis, for if the aqueous is formed by dialysis, either it must have the same urea content as blood or some explanation for the discrepancy must be found. A series of experiments were conducted in which were made: a comparison of the urea content of the aqueous humor of the two eyes and of the blood in normal animals, a comparison of the urea content of primary and of secondary aqueous humor, a determination of the rate of increase of urea in the aqueous following injection of urea into the blood stream, and a comparison of the urea content of the aqueous and of the blood after removal of the parasympathetic nerve supply on one side. Experiments were also made to determine the effect on the urea content of the aqueous of bathing the cornea with solutions of varying urea concentration, to find the effect of protoplasmic poisons on the urea content of the aqueous, to measure the aqueous urea content in sympathectomized cats, and to compare the urea content of the aqueous and of the blood in human eyes. As a result of these experiments, the authors conclude that under normal conditions the aqueous as it is formed contains less urea than the blood stream. This is due to a lack of permeability on the part of the blood-aqueous barrier, which breaks down if the intraocular pressure is reduced to zero. The barrier is effective for a period in preventing increases in blood urea from reaching the aqueous, for it takes over seven hours for the aqueous urea to equilibrate with the blood urea when this is artificially increased and maintained at a new high level. No evidence was obtained of any nervous mechanism controlling the blood-aqueous barrier as far as the secretion of urea is concerned.

J. Hewitt Judd.

Novoa-Recio, F. E. **Importance of X rays and red-blood-cell sedimentation rate in the diagnosis and treatment of different forms of arthritis complicated with iritis.** Arch. de Oft. de Buenos Aires, 1941, v. 16, Jan., p. 36.

The determination of the red-blood-cell sedimentation rate is valuable in the etiologic investigation of the different forms of iritis of "rheumatic" origin. Chronic progressive polyarthritis and ankylopoietic spondylarthritis are the two most common arthropathies characterized by considerable increase in the sedimentation rate. In spondylarthrosis, X rays of the sacro-iliac joints establish an early diagnosis. The prac-

tical importance of a better classification of "rheumatic" iritis is based on the fact that progressive chronic polyarthritis and anklyopoietic spondylarthritis, as well as the iritis accompanying them, can be favorably influenced by gold therapy. (Case reports, illustrations, bibliography.)

Plinio Montalván.

Richter, P. A. **Control of pain in acute iridocyclitis with isoamylhydrocupreine.** Arch. of Ophth., 1942, v. 27, March, pp. 579-581.

Twenty-two patients with acute iridocyclitis in which supraorbital pain was a prominent feature were treated by injecting the region of the supraorbital nerve with a 1 to 500 solution of isoamylhydrocupreine dihydrochloride in 1-percent solution of procaine hydrochloride, to which 8 minims of epinephrine per ounce had been added. An average of 0.5 c.c. of the mixture was used. Severe supraorbital pain was completely abolished in 19 for a period of from 24 to 48 hours, after which the pain in the region was relatively mild. In three cases there was a definite lessening of pain over the brow, although complete analgesia was not obtained. The only undesirable feature was the frequent occurrence of edema involving the upper lid 12 to 24 hours after the injection. This usually disappeared in from 24 to 48 hours.

J. Hewitt Judd.

Santa Cecilia, J. **Persistent pupillary membrane from iris to cornea.** Ophtalmos, 1941, v. 2, no. 2, pp. 291-293.

A branching membrane with a single attachment to the cornea and multiple attachments to the iris is described, and illustrated with three drawings and one photograph. (References.)

W. H. Crisp.

Schupfer, Francesco. **Researches on increasing the potency of adrenalin by ascorbic acid in the ophthalmic field.** Boll. d'Ocul., 1940, v. 18, March, pp. 243-253.

The author's experiments indicate that the mydriatic action of adrenalin on the irises of isolated eyes of frogs and oxen is greatly increased by ascorbic acid. This is true both as to the time of onset of dilatation and as to its degree. The writer argues that the phenomenon is not due to synergy, since the two drugs have opposite effects on the iris. The action is due to a determined increased potency of the adrenalin in the presence of the ascorbic acid. (2 figures.) M. Lombardo.

Zentmayer, William. **Severe uveitis with associated alopecia, poliosis, vitiligo and deafness.** Arch. of Ophth., 1942, v. 27, Feb., pp. 342-344.

The clinical and laboratory findings of a case of this syndrome in a lady of 30 years are reported. Consanguinity of the parents was present. A large area of choroidal atrophy probably resulted from a previous acute diffuse serous choroiditis since in the earlier stages there had been bilateral diffuse exudate, neuroretinitis, and detachment of the retina with diffuse atrophy of the pigment layer, as is often seen in Harada's disease. (Fundus photographs, one color plate.) J. Hewitt Judd.

8

GLAUCOMA AND OCULAR TENSION

Albaugh, C. H., and Dunphy, E. B. **Cyclodiathermy.** Arch. of Ophth., 1942, v. 27, March, pp. 543-557; also Trans. Amer. Ophth. Soc., 1941, v. 39, p. 193.

After a brief review of the literature, the authors outline their technique for both nonperforating and perforating

cyclodiathermy. In the nonperforating technique, a series of applications are made immediately adjacent to one another with a flat electrode of the Weve type to the bared sclera over one half of the globe at 4 to 5 mm. from the limbus. This is usually applied to the lower half of the eye in case the upper half may be needed later as in cataract extraction. In the perforating technique, after the sclera is bared, a double row of Walker points is introduced at 3 and 5 mm. respectively from the limbus at intervals of about 1 mm. The tabulated results of operation in 32 cases reveal success in 9 out of 10 cases of hemorrhagic glaucoma, 10 out of 12 of secondary glaucoma, 4 out of 4 of primary glaucoma, and 2 out of 4 of buphthalmos. The findings in two eyeballs sectioned after this operation are presented. Nonperforating cyclodiathermy was used in a series of six normal rabbits to determine what the effects might be on normal healthy eyes. The microscopic changes checked throughout with the observations on human beings. When nonperforating cyclodiathermy is used, complications incident to opening of the eyeball, such as hemorrhage, secondary infection, and sympathetic ophthalmia, are practically eliminated. Cyclodiathermy is the operation of choice for hemorrhagic glaucoma and should be used for other forms of glaucoma when other therapy, medical or surgical, has failed (particularly in Negro patients), and when opening of the eyeball with consequent sudden reduction in the intraocular pressure is to be avoided. Eyes sectioned some time after the operation show that it causes definite destruction of the ciliary body and that the epithelial components do not regenerate completely. J. Hewitt Judd.

Bhave, L. S. **Reopening of the cicatrized trephine hole after Elliot's sclerocorneal trephining operation.** Indian Jour. Ophth., 1941, v. 2, July, p. 99.

Two cases in which tension was satisfactorily controlled by reopening the trephine hole are reported. After eversion of a conjunctival flap, an iris repositor was put into the anterior chamber through the blocked trephine hole. After four days the cicatrix was again filtering in one case and in the other case filtration was re-established within a week. Edna M. Reynolds.

Castelli, Adolfo. **Contribution to knowledge of pathologic anatomy and etiology of congenital hydrophthalmos.** Ann. di Ottal., 1940, v. 68, Nov., pp. 801-824.

A case of bilateral hydrophthalmos is reported in a child who died of erysipelas at the age of a few weeks. The abnormality of the eyes was noticed only two weeks after birth. The child was one of twins. The other twin survived and had normal eyes.

The hydrophthalmic eyes, which had undergone no inflammatory changes, were enucleated after death and examined histologically. The most important departures from normal were found to consist in very evident malformation of the angle of the anterior chamber. The canal of Schlemm was in great part atresic or completely lacking; where present, it was very narrow, had the form of a slit, and was displaced laterally. It was separated from the angle by a thick layer of lamellas having a few gaps through which the filtration of aqueous in sufficient quantity was very doubtful. The meshwork of the angle of the anterior chamber had a fetal aspect, resembling the ligamentum pectinatum as found in a fetus of

six months. The uvea, and in particular the choroid, was hypoplastic.

It is evident that in this case the mechanism of glaucoma must be hydrostatic, the increased pressure resulting from insuffiency of the anterior ways of elimination of the intraocular fluids. The congenital malformations of the angle and of the uvea may be attributed to an arrest or deviation of development during fetal life; the cause thereof may reside in either a constitutional or a local mechanical factor. Castelli concludes that congenital hydrophthalmos may arise independently of inflammatory changes. When these are present they may be regarded as secondary or as complications, but not as having played an essential part in the production of hydrophthalmos.

Harry K. Messenger.

Chamma, Raul. **Ocular tension in normal eyes as shown by 1,803 tonometries.** Ophtalmos, 1941, v. 2, no. 2, pp. 379-381.

Statistical tables with a brief commentary. The kind of tonometer used is not stated. The mean measurement was 20.5 mm. W. H. Crisp.

Clarke, S. T. **Goniotomy.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 423-425.

Danielson, R. W., Long, J. C., and Sherwood, R. O. **Sutures for cyclodialysis.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 454-455. (One illustration.)

Hansraf, Jadavji. **Treatment of glaucoma.** Indian Jour. Ophth., 1941, v. 2, July, p. 87.

Simple iridectomy and sclerocorneal trephining are discussed. The complications and sequelae of the Elliot trephine operation are listed and treatment of each of the sequelae is outlined.

Edna M. Reynolds.

Kronfeld, P. C., and Grossman, E. E. **The relation of the gonioscopic findings to the incidence of secondary glaucoma in operative aphakia.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, 45th mtg., May-June, p. 184.

This study indicates that delayed closure of an operative incision actually leads to formation of peripheral anterior synechia of an extent depending on the length of delay, and perhaps also upon the texture of the anterior-border layer of the iris. The occurrence of glaucoma in such cases is shown to depend upon and to be secondary to the presence of extensive peripheral anterior synechias. Gonioscopy is a valuable means of foretelling derangements of intraocular pressure. (2 tables, 3 figures, discussion.)

George H. Stine.

McLean, J. M. **Gonioscopy in relation to common glaucoma operations.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, 45th mtg., May-June, p. 176.

This study covers chiefly the role of synechias in the development of glaucoma both preoperative and postoperative. (4 tables, 8 figures, discussion.)

George H. Stine.

O'Brien, C. S., and Swan, K. C. **Carbaminoylcholine chloride in the treatment of glaucoma simplex.** Arch. of Ophth., 1942, v. 27, Feb., pp. 253-263; also Trans. Amer. Ophth. Soc., 1941, v. 39, p. 175.

The normal cornea is relatively impermeable to carbaminoylcholine chloride in aqueous solution, but the drug is well absorbed when dissolved in a vehicle containing a surface tension-reducing agent such as zephiran. Massage of the cornea through the lids further enhances absorption. When absorbed the drug reduces intraocular

pressure, is a powerful miotic, and produces spasm of accommodation. Determination of the comparative effects of a 1.5-percent carbaminoylcholine-chloride solution and 2-percent pilocarpine-nitrate solution on normal eyes of ten students showed that the former had a more pronounced and more prolonged action. In a group of 34 eyes with advanced glaucoma simplex the drug in zephiran solution reduced the tension to below 25 mm. of mercury in all cases and there was no further loss of visual field over periods up to twenty months, even in those cases where pilocarpine had failed, or even after failure of pilocarpine following unsuccessful operations. In cases of early involvement the drug controls the tension more effectively than pilocarpine and may be administered less frequently. Carbaminoylcholine chloride in zephiran solution is stable and nonirritating, and no ill effects are noted from prolonged administration. Systemic reactions and local sensitivity to the drug are rare.

J. Hewitt Judd.

Pimentel, P. C. **Consanguinity and morbid heredity.** Ophtalmos, 1941, v. 2, no. 2, pp. 329-334. (See Section 17, Systemic diseases and parasites.)

Queiroga, Geraldo. **Considerations on acidification of the vitreous humor in glaucoma.** Ophtalmos, 1941, v. 2, no. 2, pp. 364-365.

The author followed the method of Redslob, whose six cases he summarizes. Redslob and also Reiss had punctured the anterior chamber and injected into the vitreous first a 7 per 1000 solution of phosphoric acid and later a solution of 2-percent phosphoric acid. Queiroga's cases were two in number. In a case of secondary glaucoma with posterior synechias, he injected into the vitreous 0.2 c.c. of 2-percent phosphoric-acid solution. The injection was tolerated perfectly, and nine days later it became possible to break the synechias by means of atropine, which had previously been ineffective. In the second case, chronic simple glaucoma had been treated unsuccessfully with cyclodialysis in connection with sclerectoiridectomy. The tension of the eye was 55 mm. The following day 0.2 c.c. of 2-percent phosphoric-acid solution was injected into the vitreous. Two days later the tension of the eye was 15 mm. In the next three weeks the tension ranged between 18 and 20 mm., showing no increase after use of homatropine. The first patient was 43 years of age; the second patient, arteriosclerotic, 70 years of age.

W. H. Crisp.

Triandaf, E. **Glaucoma surgery including some recently introduced procedures.** Arch. d'Opht., etc., 1939-1940, v. 3, No. 12, p. 1080.

The author reviews the more recent publications on glaucoma surgery, and gives a summary of 402 glaucoma operations performed in the eye clinic in Jassy. Of 340 patients, 256 had primary chronic glaucoma, 82 absolute glaucoma, 36 secondary glaucoma, 10 infantile glaucoma, 9 acute glaucoma, 8 hemorrhagic glaucoma, and 1 traumatic glaucoma. On the 256 patients with primary chronic glaucoma, the following operations were performed: 178 trephine operations, 48 sclero-iridectomies, 20 iridectomies, and 10 cyclodialyses. In 13 of the 178 trephine cases, surgery had to be repeated. In all cases operated on with the procedure of Lagrange, the results were satisfactory. In five of the twenty eyes operated on with iridectomy, the pressure was not reduced. The results of six out of ten cyclodialyses were satisfactory. Ninety-

two of the cases with chronic glaucoma had an initial vision of 0.1 or more. After surgery, 44 were improved, 39 showed no change, and 9 developed a slight decrease of vision. In 43 of 164 patients with chronic glaucoma and an initial vision below 0.1 in the eye to be operated upon, surgery was followed by improvement of vision; in 93 by no change in vision and in 28 by deterioration. The fields corresponded roughly to visual-acuity and other changes. Of nine eyes with acute glaucoma, five improved in vision and four remained stationary after surgery. In ten cases of infantile glaucoma, trephining was performed six times, and the operation of Lagrange and iridectomy two times each. Lowered intraocular pressure resulted in nine eyes. Among 82 cases of absolute glaucoma, increase of pressure was controlled by the trephine operation in 28; in eight cases enucleation had to be performed for continuous pain. Three of nine eyes with hemorrhagic glaucoma were reduced to normal pressure by trephining; one case was somewhat improved, and five eyes had to be enucleated.

Among 36 eyes with secondary glaucoma, 13 responded to trephining and 19 to iridectomy; in four eyes the presence of an intraocular tumor was responsible and enucleation was performed. In ten eyes, a senile cataract had to be removed after reduction of the intraocular pressure. On three eyes a late infection followed the trephine operation. No case of sympathetic ophthalmia was observed.

K. W. Ascher.

Vogt, Alfred. **Diathermic puncture of the ciliary body, an antiglaucomatous operation (cyclodiathermy).** Arch. d'Opht. etc., 1939-1940, v. 3, no. 12, p. 1071.

In 1936, Vogt started to combat glaucoma by a new procedure consisting of numerous fine diathermic punctures applied to the denudated sclera at a distance of 2 mm. from the limbus over an area covering the lower third of the sclera (Schweiz med. Woch., 1936, p. 593).

Cyclodiathermy is indicated in primary chronic glaucoma, while for acute glaucoma Vogt recommends iridectomy. Initially, cyclodiathermy is used only in cases of severe glaucoma which have not responded to other surgical procedures. In cases with iris and lens attached to the cornea, cyclodiathermy is the only possible operation. In secondary glaucoma, cyclodiathermy may be indicated where an iridectomy seems to be too dangerous for possible hemorrhage. In hermorrhagic glaucoma following thrombosis of a central retinal vein, cyclodiathermy may be of help. The operation may be repeated if not successful the first time. Certain complications are discussed. Corneal necrosis may be avoided by maintaining, during the operation, a minimum distance of 2.5 mm. from the limbus. Traumatic cataract will not occur with needles less than 0.5 mm. in length. Hemorrhage may be avoided by using needles of the prescribed diameter. Iritis and hemorrhages in the iris may occur. Increased flare in the anterior chamber is usually observed one or two days after cyclodiathermy and sometimes an exudation may form in the pupil. Escape of fluid vitreous during operation may even be desirable. Retinal detachment has not been observed, nor have retinal hemorrhages. In the only case in which it occurred, localized necrosis of the sclera did not interfere with the result of the operation.

K. W. Ascher.

9

CRYSTALLINE LENS

Almeida, Antonio. **Ten years of cataract surgery.** Ophtalmos, 1941, v. 2, no. 2, pp. 414-418.

At the Penido Burnier Institute in the course of ten years, 1,459 patients with senile cataract were operated upon, the majority with simple extraction and corneal suture. Intracapsular extraction with the Arruga forceps was reserved for immature cataracts. The author emphasizes the advantage of tearing out a large portion of the lens capsule. W. H. Crisp.

Clapp, C. A. **Alterations in the capsular epithelium in immature cataracts.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 437-445; also Trans. Amer. Ophth. Soc., 1941, v. 39, p. 73. (14 figures, references.)

Gözcü, N. **Laurence-Moon-Biedl syndrome.** Türk Oft. Gazetesi, 1941, v. 3, pt. 9, p. 420. (French abstract, p. 444.)

A case report of a 9-year-old boy, who also had a brother and sister with polydactylism. The parents were cousins. George A. Filmer.

Gradle, H. S., and Sugar, H. S. **Wound rupture after cataract extraction.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 426-430; also Trans. Amer. Ophth. Soc., 1941, v. 39, p. 94. (Illustrations, references.)

Huysmans, J. H. B. M., and Fischer, F. P. **The gas metabolism of the lens and vitreous.** Ophthalmologica, 1941, v. 102, Nov., p. 275.

The authors have collaborated in applying Huysmans' method of studying the gas metabolism of living explanted tissue, which is extraordinarily sensitive, to problems previously attacked by Fisher. The method is described in detail. It is satisfactory for studying metabolism continuously as well as in discontinuous samples. The authors have shown that the living explanted lens uses up oxygen and emits carbon dioxide with a respiration quotient of one. Of the carbohydrate, which is necessary for lens metabolism, some is oxidized, some glycolized, and some is used for the production of vitamin C. A quantitative estimation of the carbohydrate used for respiration, aerobic glycolysis, and vitamin-C synthesis discloses a remainder whose use is still unknown. The vitreous has no gas metabolism. F. Herbert Haessler.

Jackson, Edward. **Results of cataract extraction.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 403-406; also Trans. Amer. Ophth. Soc., 1941, v. 39, p. 130.

Malbrán, J., and Tosi, B. **Congenital annular cataract.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Nov., p. 543.

A case of bilateral annular cataract of congenital origin in a 14-year-old boy is reported. The special feature was absence of a nucleus, with apposition of the anterior and posterior capsules on the central portion of the lens, where a dense opacity was present. The peripheral portion of the lens was entirely normal. Collins' opinion concerning the advisability of discission in congenital annular cataract was not applicable in this case because the central membranous portion was entirely opaque. Because of its solid attachment to the anterior hyaloid membrane, however, the removal of this central membrane resulted in vitreous loss. The literature is reviewed in full detail. (Bibliography.) Plinio Montalván.

Oliviera, Archimedes de. **Considerations of familial congenital cataract.** Ophtalmos, 1941, v. 2, no. 2, pp. 382-392.

Four children of the same family, a woman and three men, had total congenital cataract with horizontal nystagmus. The ages were 36, 32, 22, and 20 years respectively. After successful operation, the patients immediately showed space appreciation, and developed a good idea of form and size, making use of the association between tactile and visual sensation. Vision of colors was quickly established, in the order green, red, blue, and yellow.

W. H. Crisp.

Páez Allende, Francisco. **Investigation of light perception and projection with a filiform pencil of light.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Dec., p. 641.

Light perception and projection in cataract are best investigated by a filiform pencil of light about 3 mm. in diameter, directed from a distance of 36 cm. from the eye under observation. The instrumental set-up consists of the ordinary lamp used for skiascopy placed at the level of the patient's head, with a circular aperture 3 mm. in diameter to project a fine pencil of light. This is reflected with a concave mirror held at 36 cm. from the patient's eye. The mirror is moved upward, downward, and to the right and left, in order to investigate the light perception of the four quadrants of the retina. This method is much more sensitive for the detection of blind areas of the fundus than the diffuse light of a candle or an ophthalmoscope. If colored lenses are placed in the aperture of the lamp the chromatic test, which is the most sensitive test for the study of retinal function in cataract patients, can be easily carried out. (Illustrations.)

Plínio Montalván.

Peter, L. C. **The Stallard versus multiple conjunctival sutures in cataract extraction.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, 45th mtg., Jan.-Feb., p. 46.

As a preventive of some of the complications encountered, the author recommends the Stallard corneoscleral suture in cataract extraction. Additional sutures in the conjunctival flap favor prompt healing. (2 figures, discussion.)

George H. Stine.

Rados, Andrew. **Marfan's syndrome (arachnodactyly coupled with dislocation of the lens).** Arch. of Ophth., 1942, v. 27, March, pp. 477-531.

The author reviews the literature and summarizes the chief clinical features, which are subdivided into skeletal, general, and ocular defects. He discusses the hereditary and the familial tendencies and reports seven cases of arachnodactyly in a group of ten cases with dislocated lenses. A statistical survey of 204 cases reported in the literature is made, and the findings presented in tabulated form. The author then summarizes the following group of theories concerning etiology and pathogenesis of arachnodactyly: toxic or infectious damage, muscular dystrophy, atavism, primary hormonal disturbance, disturbance of nervous system, congenital mesodermal dystrophy, connection with status dysraphicus, degenerative anomaly, and constitutional aberration of anlage. He concludes that Marfan's syndrome is a form of multiple aberration of the anlage, comparable to such syndromes as mongolian idiocy, the Laurence-Biedl-Moon syndrome and hypertelorism. He feels that it is extremely remote that any cases of post-natal development of true arachnodactyly occur. (Photographs, roentenograms, bibliography.)

J. Hewitt Judd.

Samuels, Bernard. **Lesions in the lens caused by purulent corneal ulcers.** Arch. of Ophth., 1942, v. 27, Feb., pp. 345-352; also Trans. Amer. Ophth. Soc., 1941, v. 39, p. 66.

The author discusses the alterations of the lens brought about by bacterial toxins diffused from corneal ulcers across the anterior-chamber space. Forty eyes were studied, in each of which there was a more or less active purulent ulcer at the time of enucleation. It is concluded that hypopyon, particularly one rich in fibrin, in its early stages protects the lens from bacterial toxins and that later, as it decomposes, it is actually harmful to the iris and the lens. In a given case it was never possible to decide how many of the alterations in the lens had taken place before the advent of the hypopyon. It was proved by a number of cases that bacterial toxins from the cornea may produce changes in the lens in the absence of hypopyon. Changes discussed are pus cells in the lens, liquefaction necrosis of lens fibers, and proliferation of the subcapsular epithelium. (Photomicrographs.)

J. Hewitt Judd.

Semeraro, E. **Intracapsular cataract operation.** Ophtalmos, 1941, v. 2, no. 2, pp. 419-422.

The author describes a modified forceps for intracapsular extraction. The points of the forceps are covered by a thin layer of India rubber. It is claimed that this arrangement makes it easier to grasp the capsule without tearing.

W. H. Crisp.

10
RETINA AND VITREOUS

Baratta, Orazio. **Contribution to the study of macular colobomas.** Ann. di Ottal., 1940, v. 68, Nov., pp. 850-862.

Four cases (two bilateral) are reported. Two could be classified as simple coloboma, and the other two showed signs of unquestionably inflammatory origin. In one of the cases (illustrated in colors) an apparent anastomosis of colloidal retinal vessels was observed. Baratta is of the opinion that macular colobomas may arise from various causes, such as intrauterine inflammation, localized choroideremia, or defect in the choriocapillaris with consequent faulty development of the pigment epithelium.

Harry K. Messenger.

Huysmans, J. H. B. M., and Fischer, F. P. **The gas metabolism of the lens and vitreous.** Ophthalmologica, 1941, Nov., v. 102, p. 275. (See Section 9, Crystalline lens.)

McDonald, P. R., and Adler, F. H. **Pigmentary degeneration of the retina.** Arch. of Ophth., 1942, v. 27, Feb., pp. 264-278; also Trans. Amer. Ophth. Soc., 1941, v. 39, p. 49.

In this investigation an attempt was made to determine whether the melanophore hormone of the pituitary gland bears any relation to pigmentary changes in the retina. This was done in three types of experiments. The first series of experiments was planned as a means of determining the action of the melanophore hormone on the retinal pigment of normal and of hypophysectomized frogs. In the second series, by repeated injections of purified melanophore hormone into young rats an attempt was made to reproduce the retinal lesions seen in retinitis pigmentosa. In the third series, an attempt was made to confirm Dax's findings of a melanophore-expanding substance in the blood of patients with retinitis pigmentosa. The results of these investigations indicate that: the injection of

purified melanophore hormone has no effect on retinal-pigment migration in the frog; the injection of melanophore hormone has no effect on retinal pigment of the rat; hypophysectomy, complete or incomplete, has no effect on retinal-pigment migration in the frog; and the assay for an active melanophore-expanding substance in the blood of patients with retinitis pigmentosa is not of significant diagnostic value. J. Hewitt Judd.

Machado, N. R. **Neuroepithelioma endophytum (glioma) of retina.** Ophtalmos, 1941, v. 2, no. 2, pp. 276-285.

The patient was a boy of almost six years. The eye was enucleated and the socket immediately treated with deep radiotherapy. Three years have passed without recurrence. (4 illustrations.) W. H. Crisp.

Meyer, Correa. **Angioid streaks of the retina.** Ophtalmos, 1941, v. 2, no. 2, pp. 309-328. (See Amer. Jour. Ophth., 1941, v. 24, p. 1229.)

Ponce de Leon, F., and Maffrand, R. A. **Retinitis punctata albescens.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Nov., p. 582.

Retinitis punctata albescens is reported in three brothers with consanguineous parents. The literature concerning the disease is reviewed in detail. (Fundus photographs, bibliography.) Plinio Montalván.

Spaeth, E. B., and De Long, P. **Eales's disease, probably tuberculous periphlebitis.** Trans. Amer. Acad. Ophth. and Otolaryng., 1941, 45th mtg., July-Aug., p. 227.

The author reports a case of progressive, recurring retinal hemorrhage associated with progressive periphlebitis of a very high degree, signs of chronic iridocyclitis in the anterior segment, practically complete retinal separation, macular hole, recurring hemorrhages into the anterior chamber, and a high degree of secondary glaucoma for which enucleation was finally necessary. The course of the disease was slightly more than ten years. The pathologic findings are presented in detail and correlated with the clinical findings. (10 figures and discussion.) George H. Stine.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Friedman, Benjamin. **Characteristics of the average normal nerve head.** Arch. of Ophth., 1942, v. 27, Feb., pp. 353-356.

This study is based on the appearance of the optic disc in 624 eyes. Of these, only 220 nerve heads presented the classic normal appearance. In nearly 10 percent of the patients the two nerves showed sufficient inequality of cupping and sufficient differences in visibility of stippling of the lamina cribrosa to mislead the observer toward an unjustified impression of previous neuritis in the less typical eye if optic-nerve atrophy should be present. Slightly more than one third of the patients presented unilateral absence of cupping, absence of stippling of the lamina cribrosa, or other atypical markings of the disc. When all the diagnostic points are taken into consideration, two thirds of the eyes examined might have offered some difficulty in ruling out previous neuritis had primary optic-nerve atrophy been found. J. Hewitt Judd.

Gonçalves, Paiva. **Results obtained in some cases of optic-nerve atrophy,**

combining medical and surgical treatment. Ophtalmos, 1941, v. 2, no. 2, pp. 344-363.

The author reports eight cases of optic atrophy secondary to brain syphilis, treated by means of retrobulbar injections of acetylcholine and atropine 1 to 1000, combined with Elliot's trephining. None showed a positive serologic reaction for lues, but all had neuropsychic disturbances on the basis of which the neurologists declared them to be carriers of cerebral syphilis.

Decidedly satisfactory results were obtained in patients coming shortly after appearance of the eye symptoms, the period in this group varying from one to four months. Only one case showed improvement in the ophthalmoscopic picture. In one patient the vision improved from shadows at 50 cm. to 0.3; in another from 0.1 in either eye to 0.8 and 0.7 respectively; in a third, from 0.1 in either eye to 0.2 and 0.7 respectively. In these three cases the interval elapsing between onset and treatment was respectively 20 days, 3 months, and 4 months. (Numerous field charts.) W. H. Crisp.

Gözberk, Rifat. **Rhinogenic optic neuritis.** Türk Oft. Gazetesi, 1941, v. 3, pt. 10, p. 461. (French abstract, p. 475.)

Two cases of optic neuritis were believed caused by infection in the nose or sinuses. George A. Filmer.

Malbran, Jorge. **Optic atrophy following compression of the chest. Its relation to traumatic retinal angiopathy or Purtscher's disease.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Sept., p. 435.

For a period of three years, the author studied a case of traumatic retinal angiopathy (Purtscher's disease) with unilateral optic atrophy. The clinical picture corresponded exactly to the classical description of the disease. In his opinion retinal angiopathy and optic atrophy consecutive to compression of the chest are but different manifestations of the same process and could be better classified as traumatic syndrome at the posterior pole of extraocular origin. Many cases of Purtscher's disease come under medical observation late in their evolution when the retinal exudates and vascular changes have subsided and the ensuing secondary optic atrophy is the only apparent ophthalmoscopic sign. The theory of fatty embolism advanced by Urbanek and Löwenstein, while it cannot explain all the symptoms, seems to be at the present time the most satisfactory one. If this theory is accepted the use of vasodilators such as acetylcholine and amyl nitrite should favor the restoration of the retinal circulation. (Bibliography.) Plinio Montalván.

Simons, L. T. **Methyl-alcohol amblyopia.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 446-451. (4 figures, references.)

Vásquez Barrière, A., and Errea, I. **Toxic optic neuritis produced by acetylarsan.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Oct., p. 504.

A case of toxic optic neuritis in a 73-year-old patient receiving intramuscular injections of acetylarsan is reported. There was rapid and marked diminution of vision which began three hours after the second injection, the first one having been given two days earlier. The visual fields were considerably contracted but the findings were essentially normal. General physical examination revealed mild generalized arteriosclerosis and senility, but there was no evidence of kidney or liver dysfunction. Daily intravenous injections of "arte-

rocholine" followed several days later by sodium hyposulphite in gradually increasing doses were given. Marked improvement of vision followed, but the fields remained entirely unchanged. The contraindications and bibliography concerning the toxic effects of acetylarsan upon the optic nerve are reviewed.

Plinio Montalván.

12

VISUAL TRACTS AND CENTERS

Khan, M. A. K. **Physiological bitemporal hemianopsia in pregnancy.** Indian Jour. Ophth., 1941, v. 2, July, p. 85.

To determine whether the physical enlargement of the pituitary gland which occurs during pregnancy is sufficient to have any effect on the field of vision, fifty patients were given perimetric tests. At the 33rd week of pregnancy the enlargement of the pituitary gland was found sufficient to cause bitemporal hemianopsia in 48 percent of the cases. This enlargement remained for at least five weeks after delivery.

Edna M. Reynolds.

King, A., and Walsh, F. B. **Temporary amaurosis and hemianopsia due to epilepsy.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 398-402. (References.)

13

EYEBALL AND ORBIT

Balaban, Salâhattin. **Orbital phlegmon following perforating corneal ulcer.** Türk Oft. Gazetesi, 1941, v. 3, pt. 10, p. 463. (French abstract, p. 476.)

Following perforation of a corneal ulcer, signs of severe orbital cellulitis developed. This was treated by incision locally and injection of prontosil.

George A. Filmer.

Crawford, H. E. **Carotid-cavernous aneurysm.** Arch. of Ophth., 1942, v. 27, March, pp. 539-542.

A man aged 52 years, in addition to the usual findings and symptoms of carotid-cavernous aneurysm, presented mydriasis, hazy cornea, and ciliary injection of the involved eye. Intraocular pressure was 45 mm. Schiötz. There was almost complete cure by ligation of the common carotid artery after preliminary compression. One week after ligation the pressure had dropped to 35 mm. and after 16 days to 28 mm. There was an enlargement of the blind spot and a residual paralysis of the external rectus muscle but the visual fields and vision were normal. It is interesting to note that no apparent harm resulted from the persistence of a pressure of 45 mm. Schiötz for over three weeks.

J. Hewitt Judd.

Gözcü, Niyazi. **Atypical Schüller-Christian syndrome.** Türk Oft. Gazetesi, 1941, v. 3, pt. 10, p. 448. (French abstract, p. 473.)

The case presented an exophthalmos secondary to deposition of exanthomatous tissue in the orbit, but had no hypophyseal symptoms.

George A. Filmer.

14

EYELIDS AND LACRIMAL APPARATUS

Artigas, Marcelino. **Recurrent corneal herpes with poliosis of the eyelashes.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Dec., p. 637. (See Section 6, Cornea and sclera.)

Bellecci, Paolo. **An old voluminous hematoma of the upper lid.** Ann. di Ottal., 1940, v. 68, Oct., pp. 792-796.

An uncommon case of a hematoma is presented, and its histologic structure and differential diagnosis are discussed. The tumor, which was on the upper lid of a 65-year-old woman, dated from a fall that had occurred fifty years

previously. The blood which had extravasated into the spaces of the subcutaneous connective tissues had been partially absorbed. Successive small traumas had caused further internal hemorrhages resulting in the gradual growth of the tumor. The extravasated blood had acted as a foreign body without however producing reaction in the surrounding tissues.

Harry K. Messenger.

Berens, Conrad. **A spatula of plastic material for expressing meibomian glands.** Amer. Jour. Ophth., 1942, v. 25, April, pp. 455-456. (One illustration.)

Contino, Filippo. **Malignant pustule of the lids: clinical considerations.** Ann. di Ottal., 1940, v. 68, Nov., pp. 825-849.

On the basis of ten case histories to which he had access, and of other cases reported in the ophthalmologic literature, Contino traces the clinical picture of malignant pustule of the lids in its varying degrees of severity. After describing the diagnostic characteristics and sketching the course and outcome of the morbid processes, he takes up the prognosis, etiology, and treatment. Contino recognizes five states: initial, progressive, regressive, ulcerative, and reparative. The remedy in which he has greatest faith is anti-anthrax serum. He disapproves of destructive local measures. Harry K. Messenger.

Gördüren, Süreyya. **Correction of ectropion by dermo-epidermal graft without pedicle.** Türk Oft. Gazetesi, 1940, v. 3, pts. 7-8, p. 380. (French abstract, p. 401.)

The author reports success in cases involving either the upper or the lower lid. George A. Filmer.

Pereira, R. F. **Our experiences with dacryocystorhinostomy.** Arch. de Oft. de Buenos Aires, 1940, v. 15, Dec., p. 603.

The author records his experience with dacryocystorhinostomy, using local anesthesia with an incision similar to that for dacryocystectomy. The osteotomy is done with Arruga's circular burr. The sac is sutured to the nasal mucous membrane and the skin closed with a continuous silk suture. The dressing is changed 48 hours after the operation, at which time gentle irrigation of the lacrimal sac is begun. If the permeability remains patent two months after the operation the operation is considered successful. (Illustrations.) Plinio Montalván.

Pimentel, P. C. **Gunn's phenomenon.** Ophtalmos, 1941, v. 2, no. 2, pp. 238-241.

The condition was seen in a girl of 13 years. Elevation of the upper lid occurred upon opening the mouth or upon carrying the lower jaw forward. Suspecting that the combination might be atavistic, the author proceeded to discover whether it might be observed as normal in lower animals. He found it present in the cat and the puppy during mastication. The phenomenon was illustrated cinematographically as it occurred in the patient and the cat.

W. H. Crisp.

Tahsin, Muammer. **Relationship between trachoma and the lacrimal gland.** Türk Oft. Gazetesi, 1940, v. 3, pts. 7-8, p. 385. (French abstract, p. 402.)

Two individuals with chronic trachoma of the cornea and conjunctiva showed also a swelling of the lacrimal gland. Portions of the glands were extirpated, and microscopic examination revealed chronic inflammatory tissue resembling tuberculosis.

George A. Filmer.

Valle, Donato. **Our experience with the dacryostomy of Dupuy-Dutemps.** Ophtalmos, 1941, v. 2, no. 2, pp. 443-465.

With condensed reports of 21 cases, the author discusses some details of the Dupuy-Dutemps operation. He prefers this operation to expiration for cataract cases complicated by dacryocystitis. With certain instrumental modifications, he has been able to reduce the average operative time to 31 minutes. (9 illustrations, references.)

W. H. Crisp.

NEWS ITEMS

Edited by DR. RALPH H. MILLER
803 Carew Tower, Cincinnati

News items should reach the editor by the twelfth of the month

DEATHS

Dr. John Calvin Hubenthal, Belmont, Wisconsin, died January 18, 1942, aged 73 years.

Dr. James Eldred Miller, Huntsville, Alabama, died February 27, 1942, aged 59 years.

Dr. Willard Anthony Thompson, Dixon, Illinois, died March 1, 1942, aged 59 years.

Dr. Walter Raleigh Breeding, Marysville, Kansas, died January 9, 1942, aged 77 years.

Dr. Thomas F. Brady, Detroit, Michigan, died January 31, 1942, aged 63 years.

Dr. Henry Robertson Skeel, New York, New York, died March 22, 1942, aged 56 years.

Dr. John Flavius Dunn, Arlington, Kentucky, died March 7, 1941, aged 61 years.

Dr. Albion James Howell, Berkeley, California, died recently, aged 45 years.

Dr. Richard Clyde Sebern, Fort Dodge, Iowa, died February 18, 1942, aged 60 years.

Dr. Robert Black Hopkins, Milton, Delaware, died March 8, 1942, aged 76 years.

MISCELLANEOUS

The following ophthalmic institutions are participating in the establishment of an international graduate-student exchange through the generosity of the W. K. Kellogg Foundation of Battle Creek, Michigan, under the auspices of the Pan-American Congress of Ophthalmology: The Massachusetts Eye and Ear Infirmary, The Ophthalmic Institute of Columbia University, Bellevue Hospital and College, New York Eye and Ear Infirmary, Wills Eye Hospital of Philadelphia, Wilmer Institute of Johns Hopkins, University of Michigan, University of Cincinnati, Northwestern University, Illinois Eye and Ear Infirmary, Cook County Hospital, The Mayo Clinic, University of Iowa, Washington University of Saint Louis, Tulane University in New Orleans, Leland Stanford University, and the University of California.

The American Congress of Physical Therapy will hold its twenty-first annual scientific and clinical session September 9, 10, 11, and 12, 1942, inclusive, at the Hotel William Penn, Pittsburgh, Pennsylvania. For information concerning the seminar and program of the convention proper, address the American Congress of Physical Therapy, 30 North Michigan Avenue, Chicago, Illinois.

The Eye Pathological Laboratory of Grady Hospital, Atlanta, Georgia, was opened recently, and will be available to all ophthalmologists. It is a gift of Mr. L. F. Montgomery, Atlanta, an alumnus of Emory University. Dr. F. Phinizy Calhoun, Jr., and Dr. William T. Edwards are in charge of the laboratory.

Four colleges and universities, in coöperation with the National Society for the Prevention of Blindness, are offering courses for the training of teachers and supervisors of sight-saving classes this summer (1942). The institutions and the dates of these courses are as follows: Peabody College for Teachers, Nashville, Tennessee, June 22d to August 1st; Wayne University, Detroit, Michigan, June 29th to August 7th; State Teachers College, Buffalo, New York, June 29th to August 7th; and Teachers College, Columbia University, New York City, July 6th to August 14th.

Details regarding the courses may be obtained from the respective colleges or from the National Society for the Prevention of Blindness, 1790 Broadway, New York City.

Mobile optical units to supply soldiers with spectacles have been organized and will accompany U. S. forces in the field, the War Department recently announced. Recruits needing glasses, under new regulations, will be accepted and supplied the corrective devices without cost. This service is provided both combatant and noncombatant forces.

The Dartmouth Eye Institute announced an eikonometry seminar of two weeks' duration with the following schedule of dates: May 18th through May 30th; August 17th through August 29th; and December 7th through December 19th. The number of candidates for each enrollment has been limited to 10. Information regarding the prerequisites for admittance to the course and application blanks can be obtained from the Teaching Division, Dartmouth Eye Institute, Hanover, New Hampshire.

The American Board of Ophthalmology held a Military Dinner at the Marlborough-Blenheim Hotel, Atlantic City, on June 9, 1942. Dr. William L. Benedict, Mayo Clinic, was chairman and toastmaster. The program, designed to aid in working out a suitable program for training ophthalmologists for military and civilian needs during the emergency as well as for the future, consisted of the following speakers: Drs. S. Judd Beach, Portland, Maine; Walter B. Lancaster, Hanover, New Hampshire; Derrick Vail, Cincinnati, Ohio; Conrad Berens, New York City; Colonel

Leonard G. Rowntree, Washington, D.C.; Colonel Frederick H. Thorne, Washington, D.C.; and Commander Clifford A. Swanson, Washington, D.C.

Societies

A joint meeting of the Southern Anthracite, the Wilkes-Barre, and the Reading Eye, Ear, Nose, and Throat Societies was held on April 29th for the purpose of promoting the formation of the Eastern Pennsylvania Association of Eye, Ear, Nose, and Throat societies. The following physicians participated in the scientific program: Benjamin F. Souders, Reading; Thomas R. Gagion, Pittston; Horace J. Williams, Philadelphia; Douglas MacFarlan, Philadelphia; and Algernon B. Reese, New York City. The temporary officers of the proposed group are Dr. Lewis T. Buckman, chairman, and Dr. James E. Landis, secretary.

The annual congress of the Ophthalmological Society of Egypt took place at 42 Kasr el Ainy Street, Cairo, on Friday and Saturday, March 27 and 28, 1942. A symposium on "Syphilis and the eye" was presented.

The thirtieth annual session of the Pacific Coast Oto-Ophthalmological Society was held May 11th to 13th, at the Benson Hotel, Portland, Oregon, with Dr. Ralph A. Fenton presiding. The title of his address was "War and peace." Among the speakers was Dr. Phillips Thygeson, New York City, who presented a paper on "The sulfanilamide group." In addition to the series of lectures, instruction courses were held as well as a special motion-picture program.

At the meeting of the Louisiana-Mississippi Ophthalmological and Otolaryngological Society on May 11th, the following ophthalmologic papers were presented: "Surgery of the obliques—The indications and contraindications" by Dr. James W. White, New York City, and "Clinical significance of certain vascular lesions in the retina" by Dr. Henry P. Wagener, Rochester, Minnesota.

The Reading Eye, Ear, Nose, and Throat Society held its regular meeting on April 15th with Dr. Luther C. Peter, Philadelphia, as guest speaker. The title of his contribution was "Problems in the management of concomitant squint." The officers of the society elected at this meeting were Dr. Solon L. Rhode, president, and Dr. Paul C. Craig, secretary.

The New York Society for Clinical Ophthalmology held its fiftieth regular meeting on May 4th with the presentation of the following program: "Clinical varieties of nystagmus and their interpretation" and "A new principle of exophthalmometry" by Dr. Alfred Kesterbaum; "Recent advances in cataract surgery" by Dr. Daniel B. Kirby; "Acute epidemic keratoconjunctivitis (viral)" by Dr. Milton L. Berliner; and "Herpes zoster ophthalmicus complicated by external ocular paresis" by Dr. Alfred Weintraub.

Personals

The guest speaker at the recent dinner meeting of the Cleveland Ophthalmological Club was Dr. Watson Gailey of Bloomington, Illinois. His subject was "The complications of cataract extraction" and was illustrated with beautiful colored moving pictures.

Dr. Jay M. Arena, Durham, North Carolina, spoke on "The use of sulfonamide derivatives in syphilitic interstitial keratitis" at the eighty-ninth annual session of the Medical Society of the State of North Carolina, held May 11th to 13th.

At the one-hundred-and-fifty-first annual session of the New Hampshire Medical Society, Dr. Andrew L. MacMillan, Jr., presented a paper on "Methods and problems of vision testing in school children for screening purposes."

Among the speakers at the annual meeting of the Medical Society of the State of New York were Dr. Walter I. Lillie, Philadelphia, and Dr. Virgil G. Casten, Boston. The subjects they discussed were "A treatment for herpes zoster ophthalmicus" and "Common motor anomalies and their treatment," respectively.

At a recent meeting of the Cleveland Medical Library Association, Dr. William E. Bruner, professor emeritus of ophthalmology, Western Reserve University, was honored by the presentation of his portrait to the association and the naming of an alcove in the library for him. Members of the Cleveland Ophthalmological Club made the room possible by their contributions.

Dr. Wiley R. Buffington, New Orleans, was one of the guest speakers at the seventy-fifth annual session of the Mississippi State Medical Association. He presented a paper on "Retinal detachment—Its surgical correction, preoperative and postoperative care."

At the eighty-third annual session of the Kansas Medical Society, held May 11th to 14th, Dr. H. Rommel Hildreth delivered an address on "Detachment of the retina—Diagnosis, management, and surgical results.

Included in the program of the annual session of the Illinois State Medical Society was Dr. Hedwig Kuhn, who spoke on "Visual problems in modern industry."

Dr. Lewis S. Patton, Athens, Georgia, was among the lecturers at the annual meeting of the Surgical Association of Atlanta and West Point Railroad Company, the Western Railway of Alabama, and Georgia Railroad on March 26th. The subject of his presentation was "Injuries of the external eye and uses of the sulfonamides in their treatment."